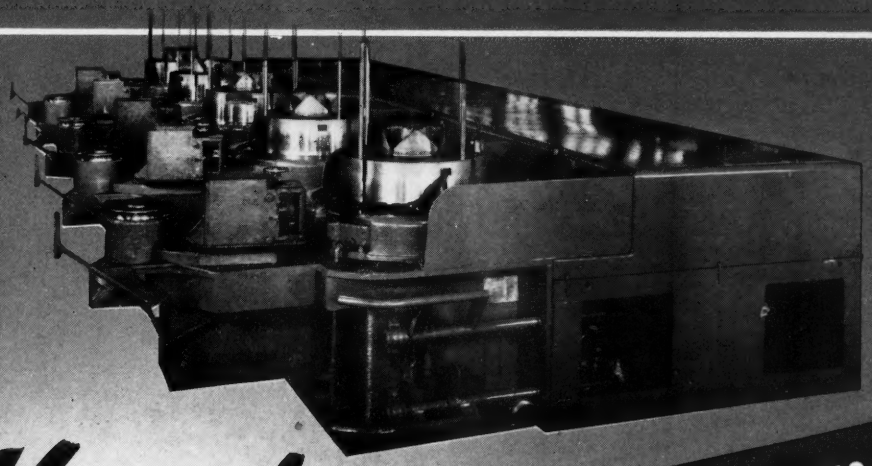
# WIRE AND WIRE PRODUCTS

FEBRUARY 1945

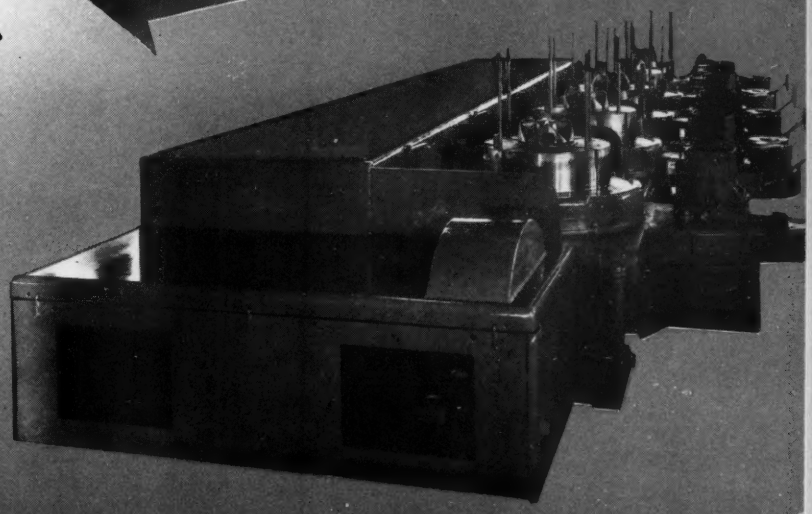




Vaughn HRX Motoblox

CONTINUOUS OPERATING DEPENDABILITY for CONTINUOUS SERVICE DEMANDS!

This particular machine exemplifies Vaughn Versatility in drawing 1" maximum low carbon wire (single hole), and 5/8" maximum high carbon wire . . . arranged for 1 single block and 4 blocks continuously . . . one 2-block and one 3-block continuously . . . 5 blocks continuously . . . or 5 single block units. Write for further details!



THE VAUGHN MACHINERY COMPANY • Cuyahoga Falls, Ohio

COMPLETE COLD DRAWING EQUIPMENT . . . Continuous or Single Hole . . . for the Largest Bars and Tubes . . . for the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys.



OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

# WILSON CYLINDRICAL BELL TYPE Furnaces are making another "Shining Example of Brass Progress" at

**THE BRIDGEPORT BRASS COMPANY**

AFTER using their first Wilson Bell Furnace for 3½ years, the Bridgeport Brass Company installed a second unit and this time included dry nitrogen atmosphere generating equipment. New standards of copper and copper alloy finishes after annealing have been established at this plant for coiled strip, with the original high yield per hour and low operating and maintenance costs.

ENGINEERED AND CONSTRUCTED BY THE

**ENGINEERING Co., Inc.**

20005 West Lake Road CLEVELAND, OHIO

Telephone ACademy 4670

Lee Wilson

INDUSTRIAL FURNACES ★ RADIANT TUBE HEATING

HEAT TREATING PROCESSES

• FOR *EXTRA* DIE LIFE ON FINE STEEL WIRE . . .

For top performance and extra die life when drawing fine steel wire, specify R-1 dies with Grade 999 Carboloy Nibs.

This ultra-hard, ultra-wear-resistant grade, for use in drawing all sizes of fine steel wire, is designed to meet the exact requirements of this class of work. It's made to hold size for extra-long peroids of use.

Available at a 20% premium over standard R-1 dies—due to additional fabricating operations required—Grade 999 actually reduces your die cost per ton by staying on the job longer than standard grades. Try "999" on your next run of fine steel wire. Stocked for prompt delivery.

• WRITE FOR CATALOG D-114-R

CARBOLOY CEMENTED CARBIDES
TRADE MARK

CARBOLOY COMPANY INC., 11171 E. 8 Mile Ave., Detroit 32, Michigan
Chicago • Cleveland • Detroit • Houston • Los Angeles • Milwaukee • Newark • Philadelphia • Pittsburgh • Thomaston, Conn.
*Authorized Distributors:* Hartley Wire Die Co., Thomaston, Conn. • Michigan Wire Die Co., Detroit, Michigan
COMPLETE DIE SERVICE FOR WIRE, BAR, TUBING AND SHEET METAL

# Keeping the lines open

Because manufacturers of telephone equipment are engaged almost exclusively in production for the Army and Navy, it's especially important that existing arteries of telephone communication remain in working order.

In the messenger strand that supports the telephone cable, and as the lashing wire used to hold the strand to the cable, bethanized wire is helping to keep the lines open and working even through the severest of storms.

Because the bethanized coating is of 99.9+ per cent pure zinc, and absolutely uniform both along and around the wire, bethanized wire is highly resistant to corrosion. In locations where corrosive conditions are exceptionally severe, the use of extra-heavy bethanized coatings will result in years of added service.

Today bethanized wire is being used in many war-related tasks in distant fighting areas and on the war-production front at home. Its uses range from handles in ski troopers' whisk brooms to protective armoring of submarine cables. Many new uses—some of them applications in which the use of zinc-coated wire was never before considered possible—are in store for bethanized wire in the post-war period.

## BETHANIZED WIRE

BETHLEHEM STEEL COMPANY, Bethlehem, Pa.

BETHLEHEM STEEL

Bethlehem Steel Export Corporation, New York City

# For Every Spring Grinding Job . . .

## NORTON DISCS

Engineered to the job — that's the reason for the success of Norton Disc Wheels in increasing spring grinding production. And they can be expertly engineered because of these Norton facilities:

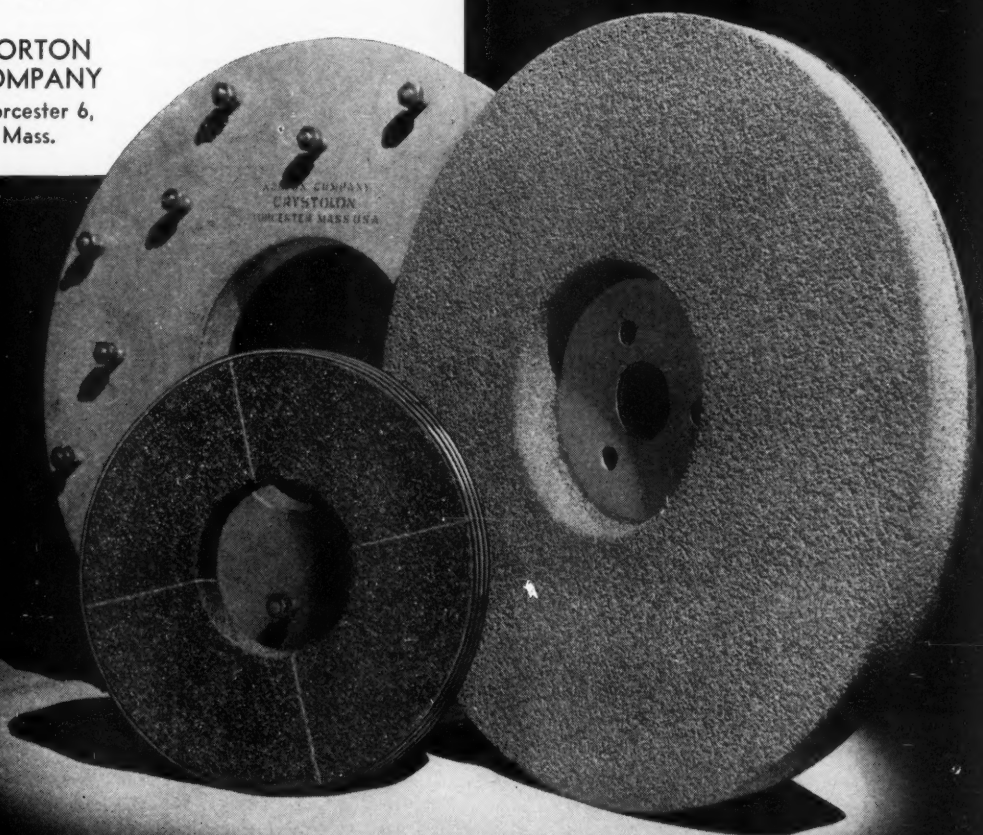
1. Resinoid, silicate and vitrified bonds — whichever your particular job requires.
2. The patented Controlled Structure process of manufacture that assures uniformity throughout each disc and from disc to disc.
3. Segmental and solid type discs with mountings to fit all sizes and kinds of grinders.
4. Experienced engineers the country over to give expert help on disc wheel selection.

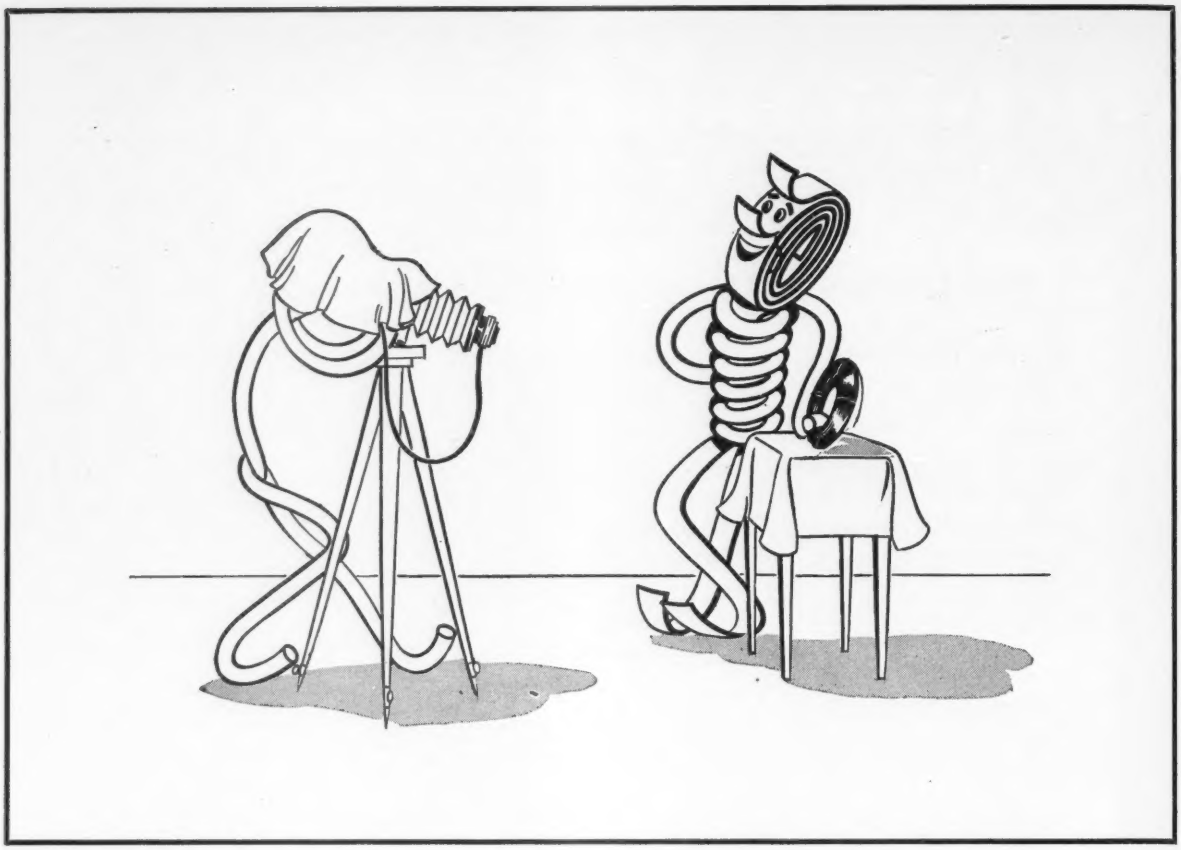
It will pay you to use Norton Discs on your spring grinding jobs.

NORTON COMPANY
Worcester 6, Mass.

W-974

NORTON ABRASIVES





# "NO PICTURE TELLS THE WHOLE STORY"

## . . . say WICK and SPEN, the Wire Men

● The Chinese could not have been referring to steel wire when they said one picture was worth a thousand words. For no picture of wire will tell you how it will act as it passes through the various forming tools.

As makers and workers of wire we at Wickwire Spencer know that unless wire is uniform in size, tensile and stiffness, tools take a beating and the finished product may fail in actual service. You may want a soft, ductile wire that will stand severe forming—or one that's strong, tough, hard drawn or tempered. But whatever type you want we can meet exact specifications.

Every step in the manufacture of Wickwire Spencer wire is taken in our own plants. Our metallurgists determine the service requirements of the wire and establish the carbon content, annealing, cleaning, finishing procedures and laboratory control tests. As a further assurance of quality, we make the steel in our own open hearths and draw it in our own modern wire mills.

Our large volume of repeat business from hundreds of old-time customers is evidence of the uniform high quality of Wickwire Spencer wire. If you want steel wire of any size, temper, analysis or finish; round or shaped . . . let us have your specifications.

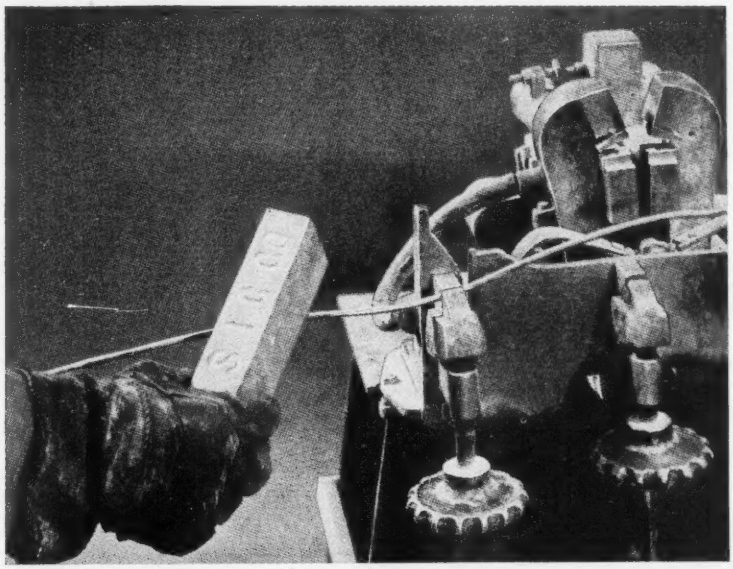
**Send your wire questions to**

# WICKWIRE SPENCER STEEL COMPANY

**500 FIFTH AVENUE, NEW YORK (18), N. Y.**

**Abilene • Buffalo • Chattanooga • Chicago • Detroit • Houston • Los Angeles • Philadelphia • San Francisco • Tulsa • Worcester**

Standardize with Standard



Standardize with Standard

Welding of Spliced Wire With Cake of SIC CO WELDCOTE

# WELDCOTE

USES: . . . . . For application to all welds on stock, either rod or wire.

FINISH: . . . . . All finishes.

CHARACTERISTICS: . . Has melting point adjusted so that bar should be rubbed all along weld while hot. This keeps scale from forming, which ordinarily occurs on the hot metal surface surrounding the weld.

The WELDCOTE bar forms a lubricant coating on each side and over the weld, also coats the metal with a pigment to serve as a carrier for the regular lubricant. This combination of lubricant and pigment prevents cutting and scratching on the die which occurs on untreated welds, because the heat involved in the welding operation causes scale, and the subsequent grinding of the burr leaves raw, uncoated metal, which can neither pull in lubricant, nor present a smooth surface to the surface of the die.

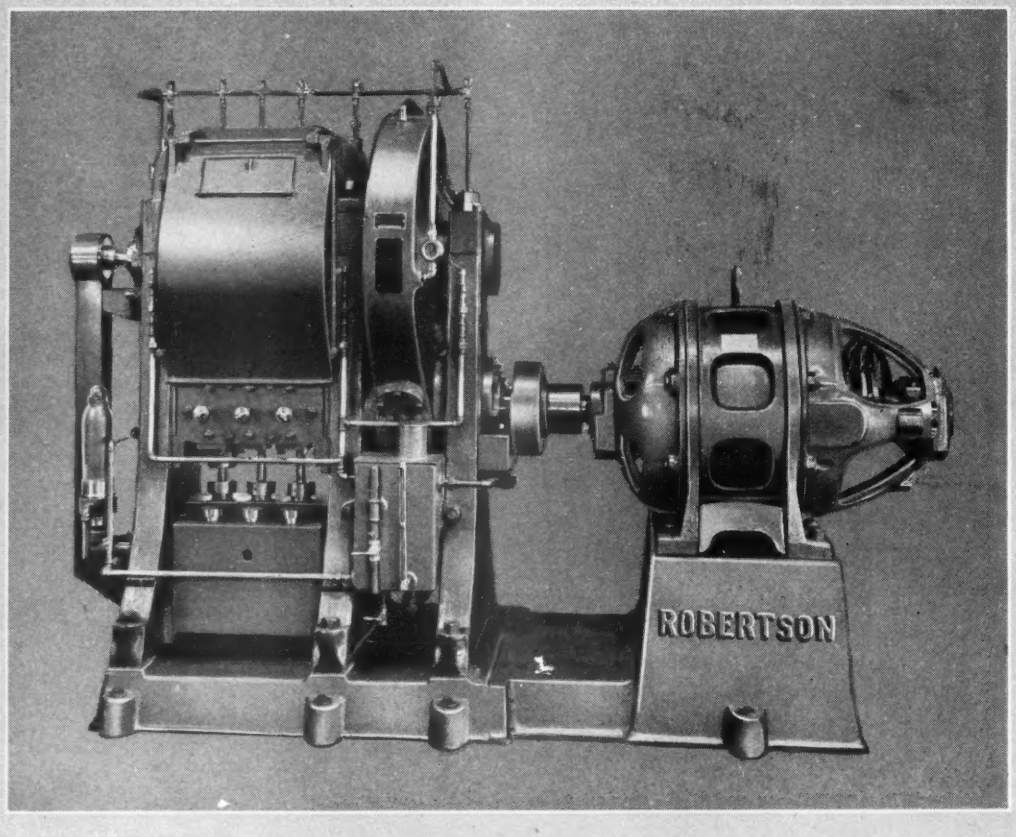
SHIPPING UNIT: . 275-300 Pound Barrel.

*Complete listing of our products contained in our catalogue, "WIRE & WIRE DRAWING—IN WORLD PROGRESS" will be sent on request. Address:*

## STANDARD INDUSTRIAL COMPOUNDS CO.

4600 W. FERDINAND ST.

## CHICAGO 44, ILLINOIS

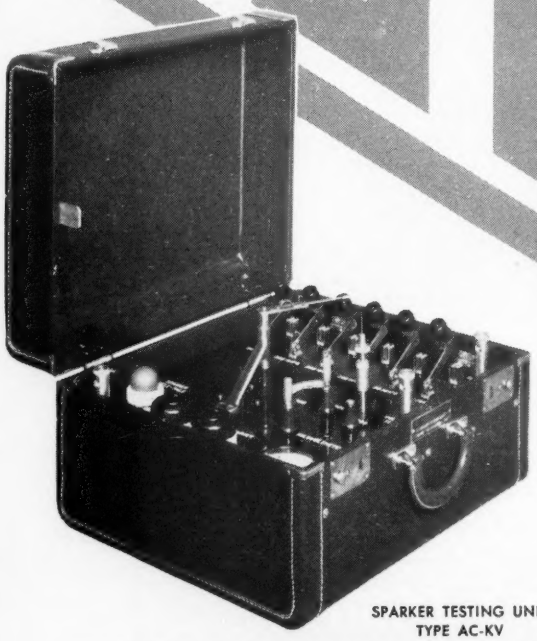



## *isn't she a beauty . . .*

You bet your life she is . . . it's Robertson's latest . . . the new "number 50" with eccentrics closed-in, and with the lubrication pump driven by bevel gears and shafting, instead of a chain. This arrangement makes it possible to have the oil circulating pump at the tank level, . . . so there is never any need for priming the pump. These new features are also used in the numbers 60, 70, 80 and 90 pumps.

Robertson High Pressure Hydraulic Pumps are designed and constructed with the skill and "know-how" of more than three quarters of a century of building hydraulic machinery. For this reason maintenance costs are low and operation efficiency high. Robertson Pumps and Lead Encasing Equipment are famous throughout the world.

JOHN **Robertson**
COMPANY INCORPORATED
125-135 WATER STREET, BROOKLYN 1, NEW YORK
Designers and Builders of all Types of Lead Encasing Machinery
Since 1858



SPARKER TESTING UNIT
TYPE AC-KV

# WIRE SPARKER CALIBRATING INSTRUMENT

This unit is suitable for testing the fault-relay circuit response efficiency of all types of wire sparkers of any make — both as to speed and as to sensitivity — from any 110 volt supply, or in place on automatic reelers. It is also equipped with an electrostatic kilovoltmeter and divider for checking sparker testing voltages up to 20,000.

The speed of response of fault relays (ranging from .001 to .1 second) is tested by a constant-speed motor, driving brass sectors of various widths past an adjustable stationary needle point.

Fault relay sensitivity is tested by placing variable series capacitances (from 25 to 575 micro-microfarads) in the test (high-tension) circuit of the wire sparker.

The unit is furnished complete with needles, attachment cords and fittings, is enclosed in an imitation leather case, 17½″ x 15″ x 11″, and weighs only 26 lbs. Electrical parts are mounted on a hinged bakelite panel, with space underneath for accessories.

*Send for specification sheet*

**JAMES L. ENTWISTLE CO.**

**43 CHURCH ST., PAWTUCKET, R. I.**

**WORLD'S LEADING MANUFACTURER OF SPARK-TESTING EQUIPMENT**

# Syncro S-10

## HIGH SPEED TUBULAR STRANDER

**For stranding bare wire up to No. 12 B&S gauge and closing insulated conductors up to 3/16" O.D.**

The Syncro S-10 Tubular Strander is a six cradle, seven wire machine, designed for 12" diameter bobbins. It has a maximum tube speed of 750 R.P.M., and is equipped with positive solonoid brakes, which are automatically applied when the motor stop is actuated. The A.C. squirrel cage type driving motor drives the machine through Syncro built Rawson Centrifugal Clutch-Couplings, assuring smooth, shockless acceleration.

The cradles are supported in anti-friction bearings and provided with automatic safety reel arbor locks. Pressure type grease fittings are installeld wherever lubrication is required.

The standard machine is furnished with grooved double capstans and carbide wire guides. If desired, a direct reading footage counter can be supplied.

This strander can be equipped with spindles for filler bobbins or cops. A binder head and/or taping head can also be incorporated in this machine and composition tube supporting rollers can be furnished if desired.

Not shown is the take-up included with this machine, which can be either friction driven, or motor operated magnetic clutch driven.

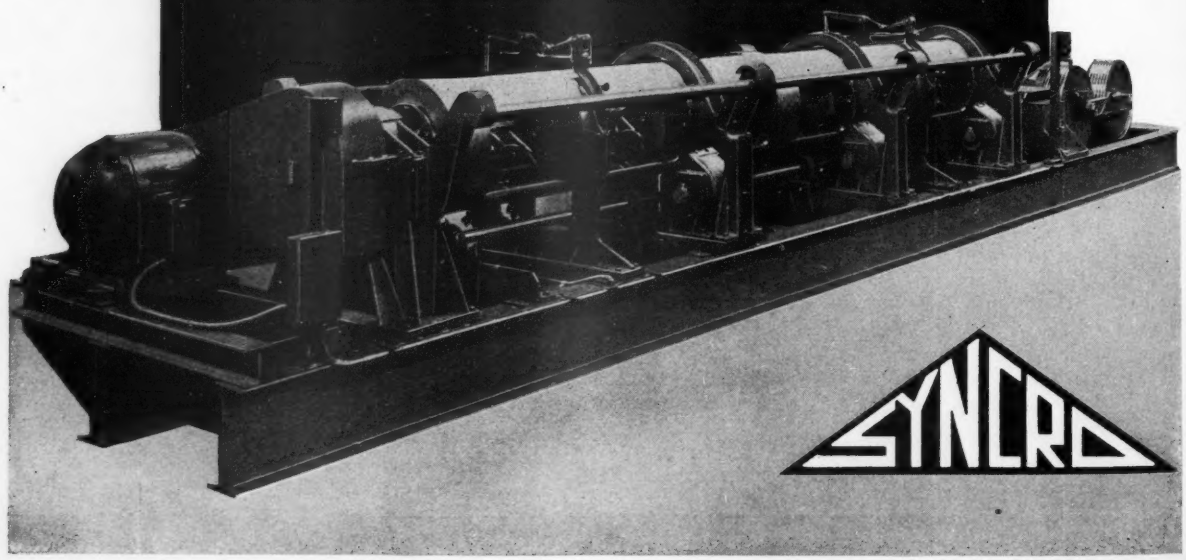
The S-10 Strander can be built to process any number of individual conductors and fillers. When used as a bare wire strander, an automatic broken wire stop is provided.

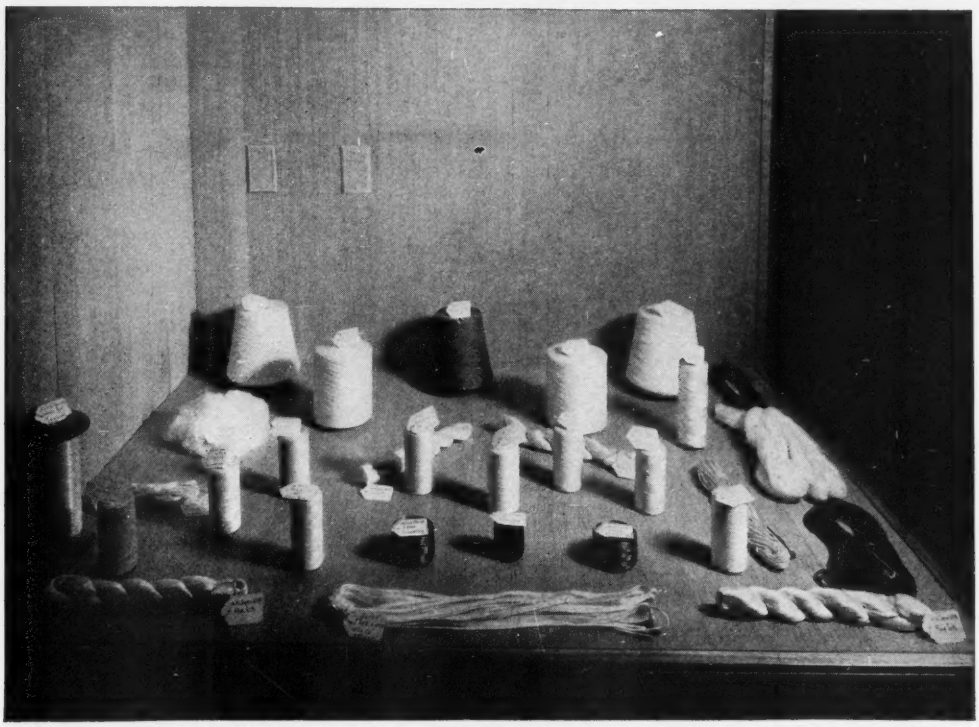
*Complete details will be forwarded promptly upon your request.*

## SYNCRO MACHINE COMPANY

EXECUTIVE OFFICES AND GENERAL WORKS—611 SAYRE AVE., PERTH AMBOY, N. J.
113 South Jefferson Street, Chicago 6, Ill.

*Represented in Canada by Canadian Elevator Equipment Company, Toronto*





YARNS FOR INDUSTRIAL USES—*This display in our New York sales office shows many of the specialized yarns now manufactured by Cheney Brothers.*

# *Promising Future of a Famous Name*

TODAY at Cheney Brothers, the future sets the pace. In our sales offices, in our mills, in our laboratories—newer, finer yarns and fabrics are constantly being perfected.

True, many of them are not yet available—for Cheney facilities are now concentrated on military production.

But these improved yarns and fabrics were actually developed from that very military production. For the fabrics of war must be scientifically designed and woven — engineered for specific purposes. A vast amount of research and the efforts of many technicians have gone into this work. With the result that Cheney products of the future will be even better than those of the past.

There will be a plentiful supply of all Cheney products—after the war is won. And Cheney Brothers, like their customers, look forward to that time. Right now, let's all remember that we bring Victory closer with every War Bond we buy today.

★ CHENEY YARNS

**CHENEY BROTHERS**

*Manufacturers of fabrics of exceptional quality since 1838*

350 FIFTH AVENUE, NEW YORK 1, N. Y.

Velvets—Pile Fabrics—Cravats—Upholstery and Decorative Fabrics
Yarns for Industry—Men's Wear Fabrics—Machine Thread—Industrial Fabrics

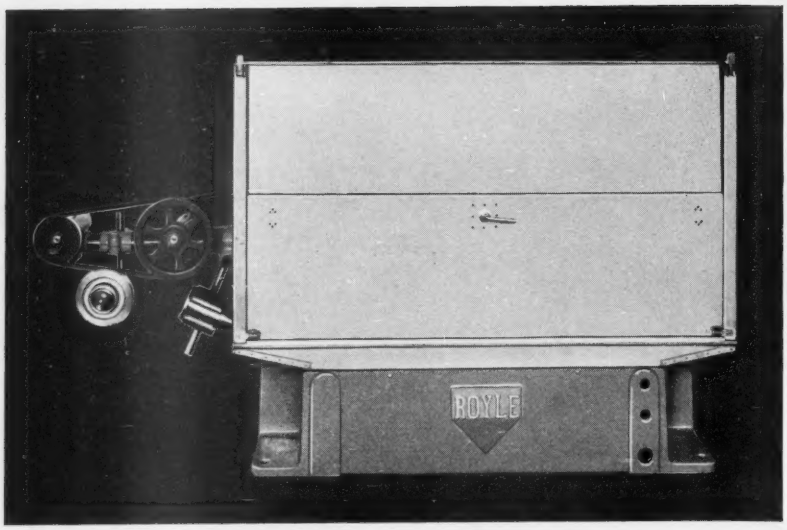
*Sales Offices*

BOSTON • PHILADELPHIA • CHICAGO • LOS ANGELES

MILLS AT MANCHESTER, CONN.

ALSO AT MANCHESTER, CONNECTICUT, A SUBSIDIARY...PIONEER PARACHUTE COMPANY

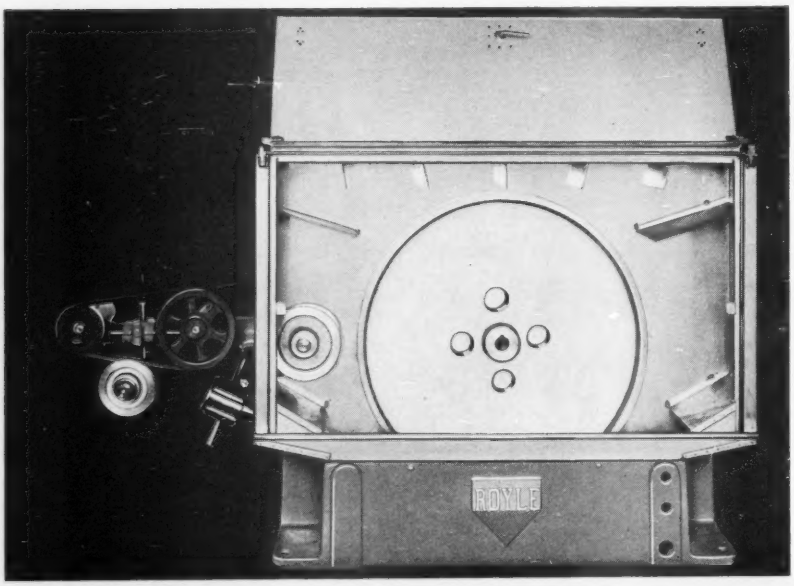
# PRESENTING
# THE ROYLE 36″
## HIGH SPEED CAPSTAN FOR RESIN INSULATED WIRE




### CHECK THESE FEATURES

- Stainless steel watertight enclosure
- Total enclosure permits higher wire speeds
- More efficient wire puller stabilizes wire speed
- Secondary idler pulleys guide wire across capstan preventing rubbing and permitting greater quantities of wire to be cooled simultaneously
- Quiet running
- All bearings are located outside of enclosure to prevent contact with water
- Built-in air wiper
- Full size folding side assures maximum accessibility
- All interior surfaces which are touched by wire or spray are of aluminum or corrosion resisting metal to withstand the chemical reaction of the various resins

*Write for Complete Details*




ARMY E NAVY

**JOHN ROYLE & SONS**

ROYLE PATERSON N. J.

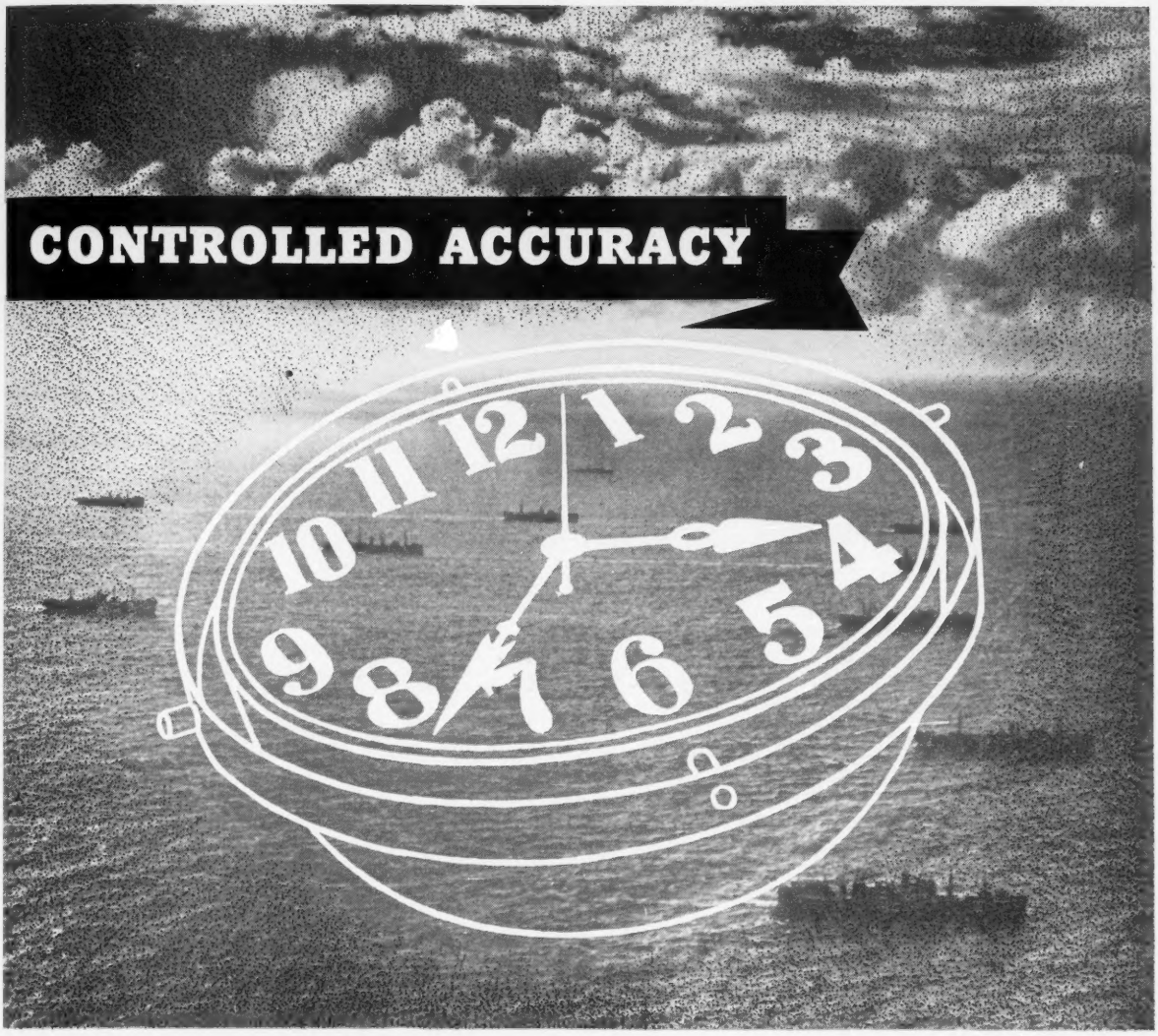
*PIONEER BUILDERS OF EXTRUSION MACHINES SINCE 1880*

Continental Europe
James Day (Machinery) Ltd.
London, England

Home Office
B. H. Davis J. W. VanRiper
SHerwood 2-8262

Akron, Ohio
J. C. Clinefelter
UNiversity 3726

**PATERSON 3, NEW JERSEY**




*Tiny precision wire for springs gives*
*Chronometer-timed convoys split-second timing.*

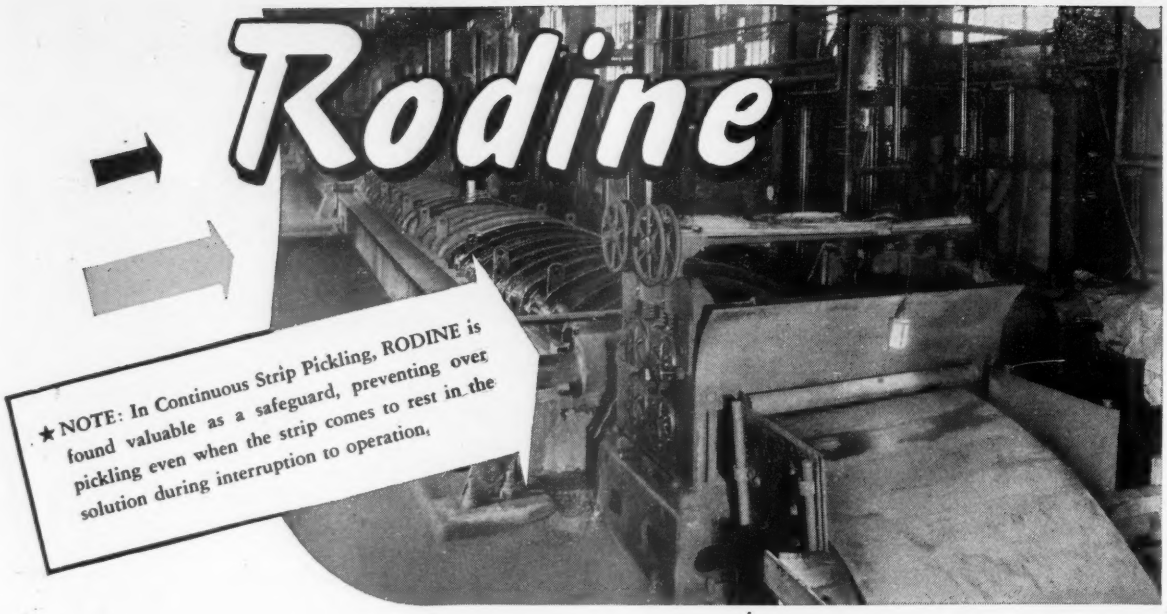
★ ★ ★ ★ ★

SPENCER *Precision* WIRE

★ ★ ★ ★

FINE STEEL AND ALLOY WIRE

Spencer Wire Company
WEST BROOKFIELD PLANT
WEST BROOKFIELD • MASS.


Rodine
★NOTE: In Continuous Strip Pickling, RODINE is found valuable as a safeguard, preventing over pickling even when the strip comes to rest in the solution during interruption to operation.

## *Makes Possible,* WITH SAFETY, *Faster Production and Increased Actual Tonnage Yield of Pickled Steel*

**RODINE** permits the use of stronger acid concentration and higher temperatures without danger of over pickling or etching thereby speeding the process and increasing output.

It is possible with **RODINE** to safely obtain increased tonnage with present equipment — a valuable consideration now when needful new equipment is difficult or impossible to secure.

**RODINE**-controlled pickling produces a smooth, bright, clean surface. There is no pickling condition which is not improved with Rodine, except where deep etching is desired. Rodine confines the action of the acid in the pickle bath to removal of scale thus minimizing the acid attack on clean metal and overcoming deep pitting and embrittlement.

There are types of **RODINE** suited to the varying pickling problems. The experience of ACP Technicians is at your service to recommend the Rodine and method best suited to meet your needs if you will write in detail to

★ ★ ★

MANUFACTURERS OF INHIBITORS AND METAL WORKING CHEMICALS

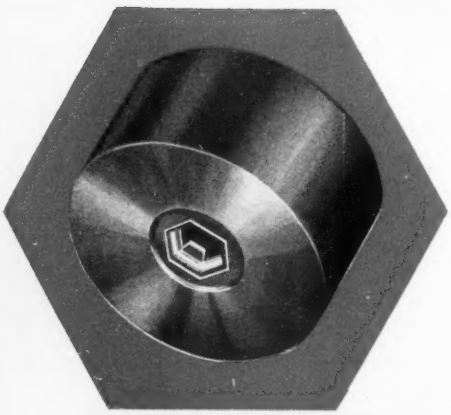
**AMERICAN CHEMICAL PAINT CO.**
AMBLER ACP PENNA.
Dept. D-2

*Note—West Coast Plants may address inquiries and orders for prompt delivery to Leon Finch, Ltd., 728 East 59th St., Los Angeles, California.*

# HARTLEY

L E Y

## THE TRADE MARK THAT STANDS FOR *Special* QUALITY and SERVICE ON *Special-Shaped* DIES



EYELET DIES
BOLT HEAD DIES
TUBING DIES

SPECIAL WEAR RESISTANT DIES
EXTRUSION DIES
WIRE DRAWING DIES

No need to worry about facilities for fast and reliable production of special-shaped dies—that's the specialty of the Hartley Wire Die Company.

Skilled workmen combined with extreme manufacturing care and most critical inspection assure you dies of the high quality you require, and the prompt service you desire.

"From blueprint to finished product" — that's Hartley service. Just send us the prints of the dies you require; no problem is too tough, no job too large or small. Every assistance we can give is yours.

MANUFACTURERS, ALSO, OF SHELL DRAWING DIES OF ALL CALIBERS FOR THE AMMUNITION PROGRAM.

**HARTLEY WIRE DIE CO.**

L E Y

*Established 1850*

MANUFACTURERS OF TUNGSTEN CARBIDE WIRE, TUBE, EYELET AND SPECIAL DIES, MANDRELS AND PUNCHES.

*Thomaston, Conn.*

# Wire For Wire Rope

WIRE for wire rope keeps these Youngstown wire mills busy, day and night. In fact, America's wire rope needs are far greater than its capacity to produce. Wire rope by the millions of feet goes to tether barrage ballons, to lash cargo to ships, to equip every tank, truck and jeep with cable for binding on loads, for rescue work, etc.

Drawing wire for wire rope is a major activity at Youngstown, now as in peacetime, and manufacturing output is geared to the maximum of our ability to produce, yet quality supersedes volume with manufacturing standards maintained at the most exacting levels. Ready now to talk to you about your wire needs, present and future, we are equipped to meet your requirements, whether they call for standard or special specifications on chemical and metallurgical characteristics and physical tolerances.

Pipe and Tubular Products - Sheets - Plates - Conduit - Bars - Electrolytic Tin Plate - Coke Tin Plate - Rods - Wire - Nails - Tie Plates and Spikes - Alloy and Yoloy Steels.

QUALITY TRADE MARK YOUNGSTOWN SERVICE

**YOUNGSTOWN**

**THE YOUNGSTOWN SHEET AND TUBE COMPANY**

YOUNGSTOWN, OHIO

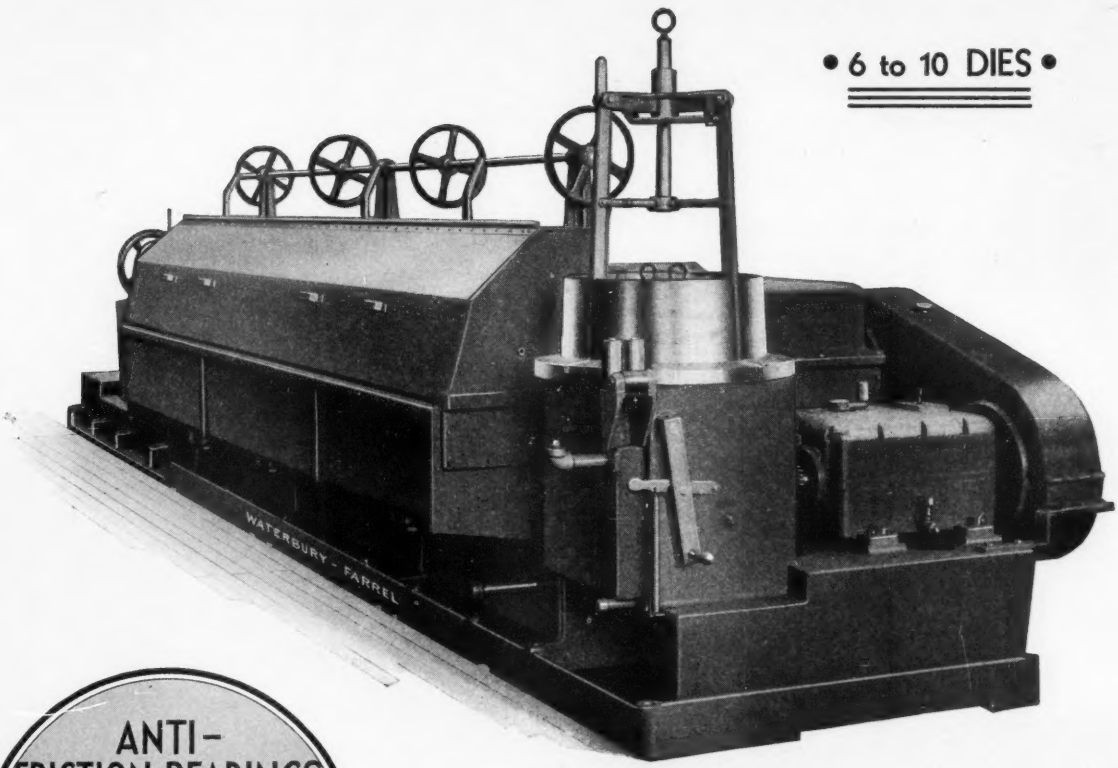
Manufacturers of

CARBON - ALLOY AND YOLOY STEELS

# WATERBURY-FARREL

## NO. 1 TANDEM WIRE DRAWING MACHINE - FOR BRASS OR COPPER

• 6 to 10 DIES •




ANTI-
FRICTION BEARINGS
FORCED
FEED LUBRICATION
SPIRAL
BEVEL GEARING

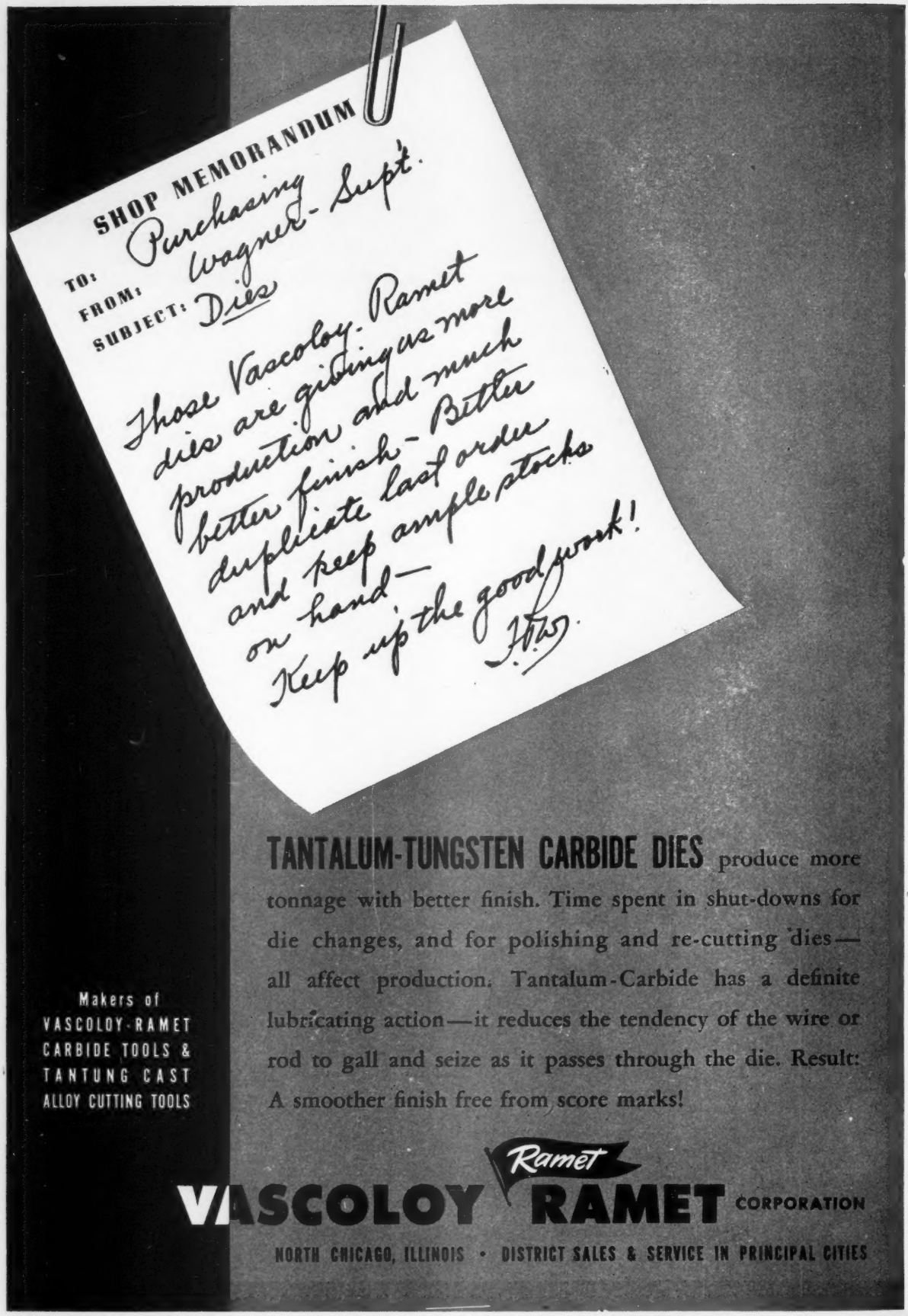
Change gearing provides four finishing speeds with a single speed AC main motor.

Block driven through a clutch which may be disengaged to permit rotation by hand.

**THE WATERBURY FARREL FOUNDRY AND MACHINE COMPANY**

WATERBURY, CONNECTICUT U.S.A.

CLEVELAND CHICAGO NEWARK, N. J.


SHOP MEMORANDUM
TO: Purchasing
FROM: Wagner - Supt.
SUBJECT: Dies
Those Vascoloy-Ramet dies are giving us more production and much better finish - Better duplicate last order and keep ample stocks on hand—
Keep up the good work!
J.W.
TANTALUM-TUNGSTEN CARBIDE DIES produce more tonnage with better finish. Time spent in shut-downs for die changes, and for polishing and re-cutting dies—all affect production. Tantalum-Carbide has a definite lubricating action—it reduces the tendency of the wire or rod to gall and seize as it passes through the die. Result: A smoother finish free from score marks!
Makers of VASCOLOY-RAMET CARBIDE TOOLS & TANTUNG CAST ALLOY CUTTING TOOLS
Ramet
VASCOLOY RAMET CORPORATION
NORTH CHICAGO, ILLINOIS • DISTRICT SALES & SERVICE IN PRINCIPAL CITIES

# ROEBLING

## From .001 Wire to 8" Strip Steel

### *For tomorrow's products at a profit... call in Roebling today!*

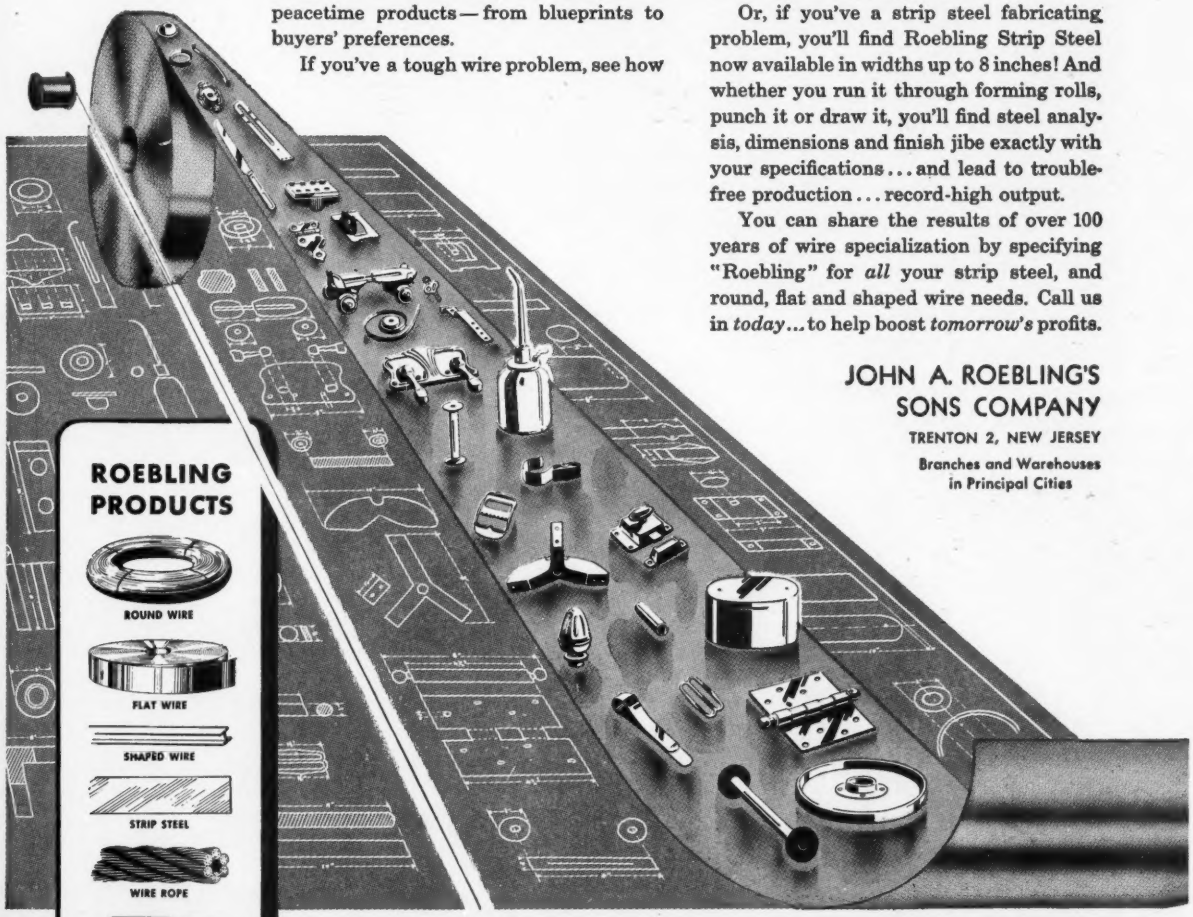
He's in the thick of things, the Roebling engineer, and he can tell you what's available *now*... what's likely to be on hand *tomorrow*. He can help you plan your peacetime products—from blueprints to buyers' preferences.

If you've a tough wire problem, see how you can crack it with the closely controlled steel analysis and grain structure, the tensile strength, ductility and dimensional accuracy of Roebling Round Wire.

Or, if you've a strip steel fabricating problem, you'll find Roebling Strip Steel now available in widths up to 8 inches! And whether you run it through forming rolls, punch it or draw it, you'll find steel analysis, dimensions and finish jibe exactly with your specifications... and lead to trouble-free production... record-high output.

You can share the results of over 100 years of wire specialization by specifying "Roebling" for *all* your strip steel, and round, flat and shaped wire needs. Call us in *today*... to help boost *tomorrow's* profits.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON 2, NEW JERSEY
Branches and Warehouses in Principal Cities



**ROEBLING PRODUCTS**


ROUND WIRE


FLAT WIRE


SHAPED WIRE


STRIP STEEL


WIRE ROPE

ELECTRICAL WIRES AND CABLES

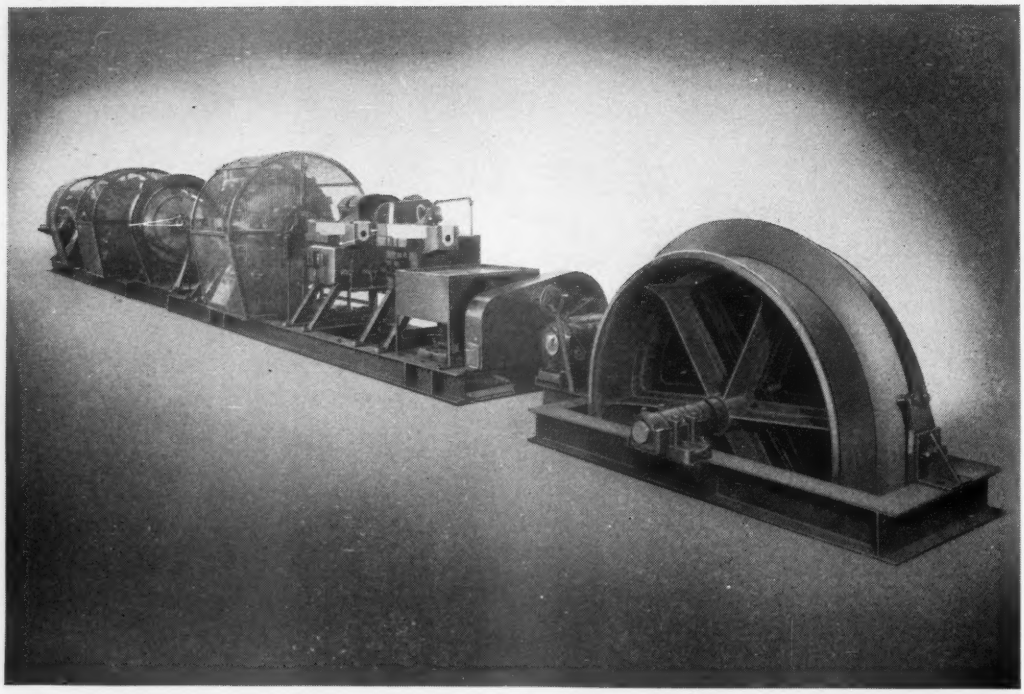
WOVEN WIRE FABRICS

WIRE ROPE AND STRAND • FITTINGS • SLINGS • SUSPENSION BRIDGES AND CABLES
COLD ROLLED STRIP • HIGH AND LOW CARBON ACID AND BASIC OPEN HEARTH STEELS
AIRCORD, SWAGED TERMINALS AND ASSEMBLIES • AERIAL WIRE ROPE SYSTEMS • ROUND
AND SHAPED WIRE • ELECTRICAL WIRES AND CABLES • WIRE CLOTH AND NETTING

JR ROEBLING

*PACEMAKER IN WIRE PRODUCTS*

# ARMORING MACHINES



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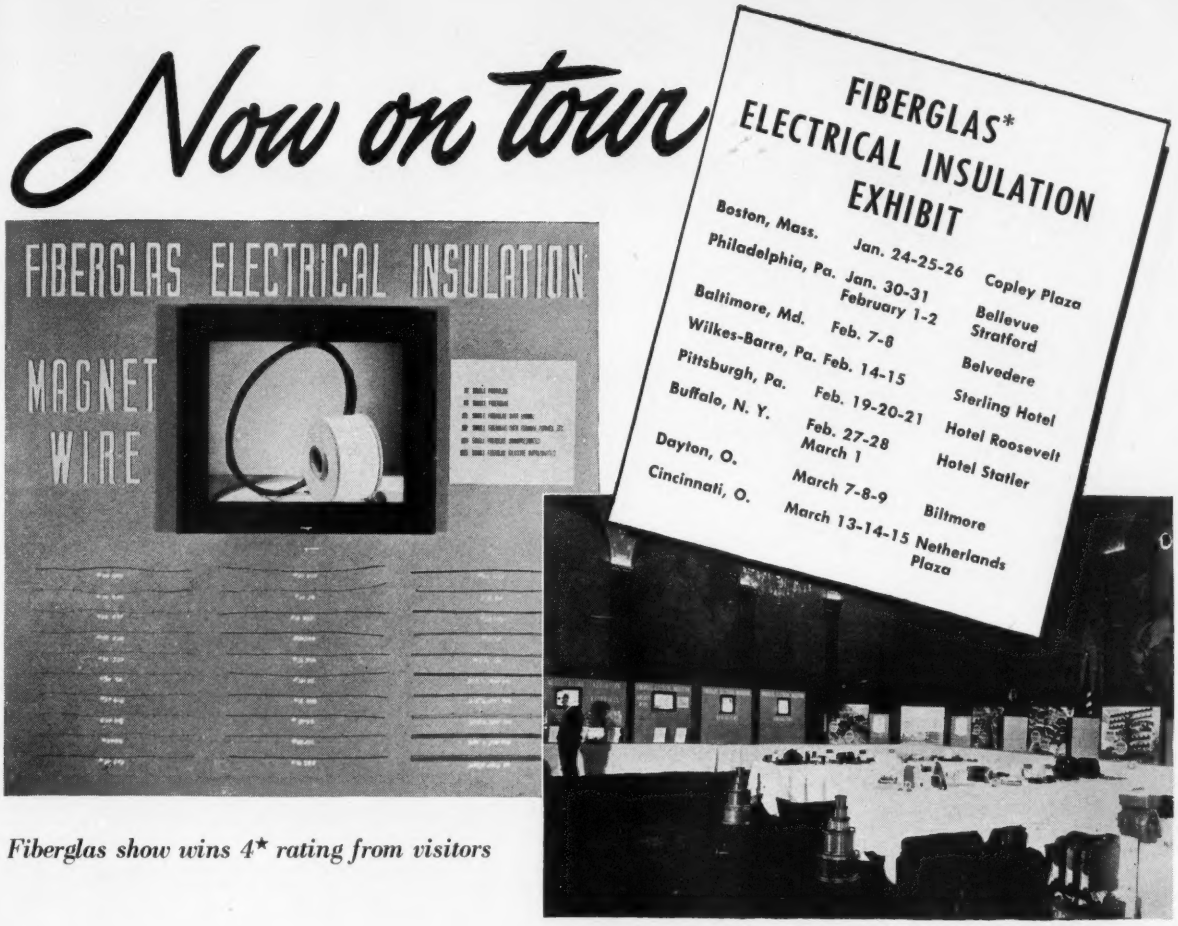
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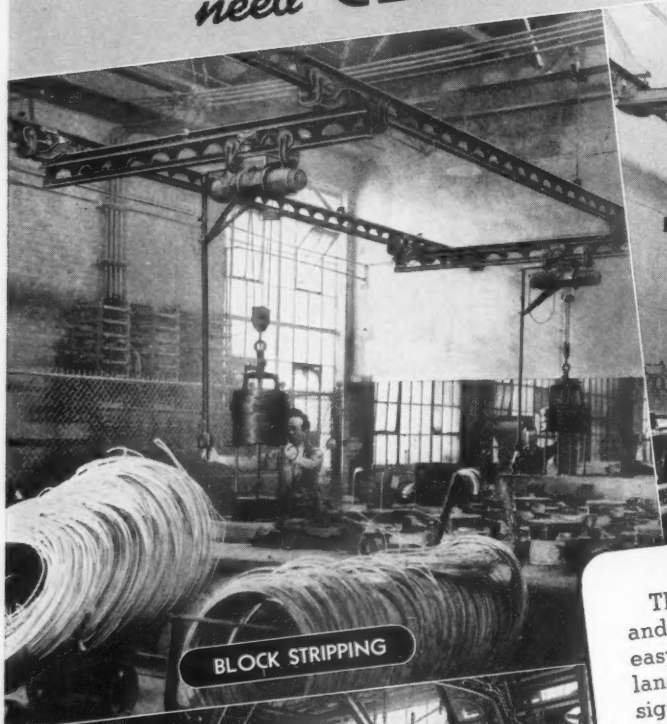

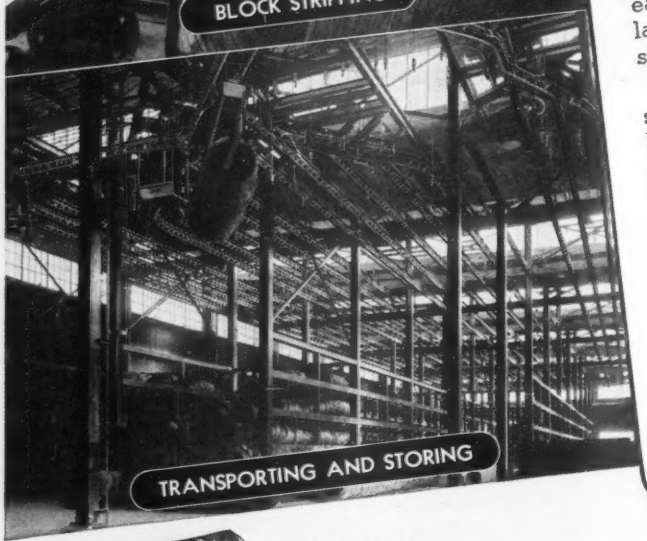


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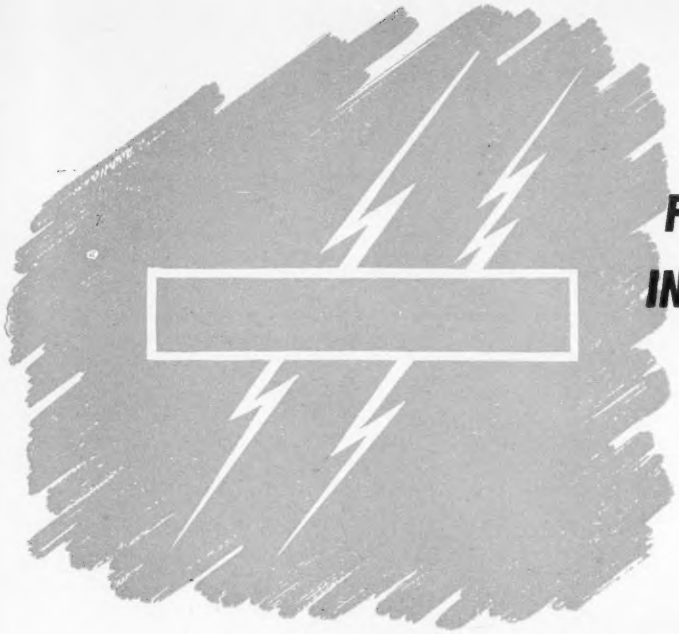

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A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

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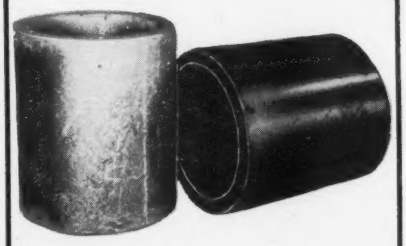

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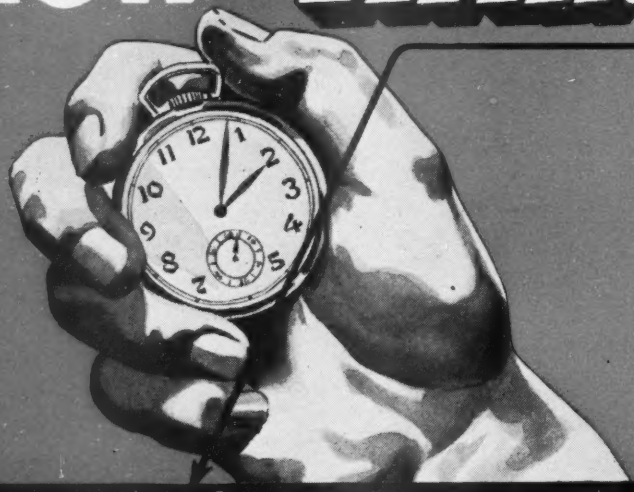

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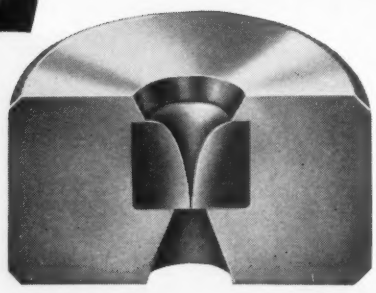
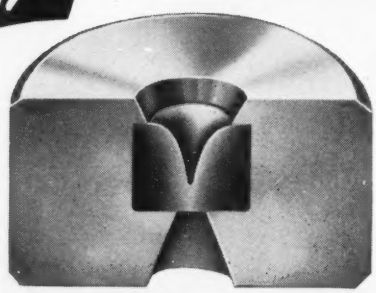
NEW WAY



**PIERCED DIE—Hole ROUGH CORED THROUGH THE NIB saves Die-User's time. Pierced hole, .003″/.004″ dia., is ready for finishing to as small as .010″ dia.**

OLD WAY



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A monthly publication devoted to the production of Wire, Rod and Strip.
Wire Products and Insulated Wire and Cable.
DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 20 FEBRUARY, 1945 No. 2


# Phosphate Coatings as Applied to Wire Drawing


By V. D. Smith

Research Department, Oakite Products, Inc.
New York, N. Y.



**Experiments with phosphate coatings show that such coatings give longer die life, impart rust resistance to wire and other advantages in wire drawing at very slight increase in production cost.** ✦ ✦ ✦


DURING the past year production tests, conducted with the co-operation of a number of wire mill superintendents, definitely established the value and many advantages of applying phosphate coatings to ferrous rods or wire. These coatings are formed easily and applied inexpensively in the cleaning house and add very little to production cost in comparison with the substantial economies that result through longer die life, increased production, rust resistance imparted to wire, improved quality of work and shorter down time of equipment because dies are less frequently replaced.

✦ ✦ ✦

THE purpose of phosphate coatings applied to ferrous rods or wire is to interpose between the metal and the die a tenacious parting layer which serves as an added lubricant for the die. The coatings are complex ferrous-ferric phosphates and other mixed iron compounds which are produced by an actual chemical reaction with the metal. This reaction between the phosphate solution and the metal ceases upon removal from the solution and rinse, but the compounds formed remain firmly bonded to the metal. The dimentional and weight changes are practically nil and the appearance is only slightly different from that of clean pickled steel.

✦ ✦ ✦

PHOSPHATE coatings on steel have been used extensively by industry for various purposes but the main difference between other industrial coatings and those most satisfactory for wire drawing operations lies in the type of crystalline structure developed. Fine grained tightly adherent coatings appear more ductile and capable of withstanding the degree of deformation required in drawing operations. Furthermore, the phosphate coatings best suited to wire mill practice must not be soluble or easily removed by subsequent immersion in hot alkaline baths.

IN addition to interposing a third layer having a greater difference of hardness than that of either the metal or the die, the crystalline coatings appear capable of absorbing the usual die lubricants and retaining or carrying them to the point at which the deformation takes place.

✦ ✦ ✦

## Method of Applying Phosphate Coatings

THE method used for obtaining phosphate coatings on rod or wire is to provide a welded black iron tank of suitable size in the cleaning cycle. A rinse tank is also desirable but not absolutely essential. Best results are obtained when the phosphate coating solution is made up at a concentration of from 2 to 4 ounces to each gallon of water and the temperature maintained at from 140° to 160° F. The pH of the solution is important and should be held within the prescribed range, since pH appears to be the controlling factor in the size of the crystals formed. The sequence of operation is to pickle and rinse the work in accordance with regular procedure, and then to immerse it in the

phosphate coating solution tank for from 8 to 10 minutes. Some agitation of the work during this time is desirable to bring fresh solution in contact with the surfaces and to expose areas which may be protected by intimate contact. After the required period of immersion, the work should be rinsed or air dried, limed and baked in the usual manner. Where space can be spared a thorough rinse is always recommended, after the coating tank, since the phosphate coating solution possesses certain cleaning characteristics that will remove much of the carbon smut left from the pickling bath. This carbon smut is presumed to be an iron carbide which is quite hard. Its removal will, therefore, result in less wear on the die.

✦ ✦ ✦

THE weight of the phosphate coatings developed varies slightly with the age and temperature of the solution but within the working range the average deposition is about 100 milligrams per square foot of area. With this deposition, the cost of the coating will be in the neighborhood of one half to one cent per hundred square foot. The heaviest loss of material, however, is not thru film formation but results from dragout. Therefore, existing cleaning house conditions such as speed of crane operation, carefulness of crane men, etc., have more bearings on the cost than chemical depletion. A check on figures indicate that during a year of operation in one mill, the cost was about ten cents per ton to treat No. 5 rods. This is a very small amount, when the savings which will be pointed out later, are considered.

✦ ✦ ✦

## Phosphate Coatings Are Non-Hygroscopic

MANY types of coatings in addition to lime have been used by the wire industry. To date they have all been what might be termed as superficially applied. That is, they rested on or adhered to the surface of the metal, and their only bond was a physical one. The phosphate coatings differ in that they are chemically bonded or form an integral part of the metal and are so firmly adherent that they elongate as the drawing operation proceeds. They are still visible after 7 or 8 holes of dry drawing and after 10 or 12 holes of wet drawing.

✦ ✦ ✦

IN an article in WIRE & WIRE PRODUCTS some time ago, the author expressed the opinion that one of the short comings of all coating materials available was that they were more or less hygroscopic and tended to induce rust. If this is the case, then it can be said that the phosphate coatings are a decided improvement since they are non-hygroscopic and impart rust resisting qualities without leaving heavy, and often objectionable, alkaline films on the work.

✦ ✦ ✦

THE type of coating which is produced in the phosphate bath appears to be continuous and its ability to hold oil is thru absorption on the surface and not because of the presence of capillaries. The absence of capillaries can be demonstrated by the dye test commonly used for testing anodized aluminum. This test consists of stamping the surface, using a rubber stamp, with a dye-type ink and immediately wiping the surface with a suitable solvent. If capillaries are present the dye is drawn into them and cannot be removed by the solvent. Tests with phosphate coatings are negative so their ability to retain oil must be due to some other property. The fact that they do retain lubricants probably accounts for the increased die life which can be obtained through their use.

✦ ✦ ✦

THIS ability to retain oil was determined by a series of laboratory tests. A group of test panels of cold rolled sheet steel were cut to approximately the same dimensions and weighed. Two types of stock were used, one having a bright shiny surface, the other being somewhat duller due to having a rougher surface. The bright samples were lettered with single letters and the dull samples with corresponding double letters.

✦ ✦ ✦

SPECIMEN A and AA being the bright and rough respectively, were untreated. B and BB were treated to produce a light phosphate coating while C and CC were given a heavy coat. The weight of the coatings were then determined by a suitable chemical means and the specimens were then immersed in an S.A.E. No. 10 oil and drained for a period of one hundred hours. To remove the drop of oil which remained on the lower corner of each specimen, they were then stacked with alternate layers of filter paper and pressed with a weight. Upon removal they were again weighed and the results are shown in Table A.

✦ ✦ ✦

FROM this it would appear that a heavy phosphate coating has the ability to retain, in some manner, more oil than clean steel or steel having only a light phosphate treatment.

✦ ✦ ✦

IT may appear that this is unrelated to wire mill practice where dry soaps are generally used as lubricants. However, the melting range of one of the popular die box soaps is from 480°F. to 520°F. and it is conceivable that this temperature could easily be reached at the throat of the die, so the soap could be absorbed in much the same manner as the lubricating oil.

✦ ✦ ✦

IT is difficult to say which of the improvements derived from phosphate coatings is the most important.

**TABLE A**

| SAMPLE | | Weight of Coating mg/sq. foot | Weight of Oil mg/sq. foot |
|---|---|---|---|
| A | untreated | 0.0 | 15.6 |
| AA | untreated | 0.0 | 19.8 |
| B | light coat | 45.6 | 64.6 |
| BB | light coat | 50.3 | 21.9 |
| C | heavy coat | 191.7 | 203.7 |
| CC | heavy coat | 173.0 | 192.4 |

If you happen to be in sales work it is quality and delivery dates, while if you are a mill man it is die life and down time which reflects production. Without attempting to evaluate such unrelated factors, we can start with die life, as some wire must be drawn before down time occurs and dies have to be replaced. The best way to get at die life is to cite an actual case of what happened in one mill. Here they were drawing rope wire having an analysis of 60 carbon and 85 to 90 manganese. The wire had previously been drawn dry through soap and lime from No. 5 rod to .054 in another department.

✦ ✦ ✦

WHEN brought to the wet wire department for further reduction, difficulty was experienced due to the fact that dies would have to be replaced after from eight to twenty hours of operation. This was costly and the shortage in manpower was such that machines were often idle because of insufficient experienced help to make new setups. The department had its own cleaning tanks so it was an easy matter to introduce a phosphate coating tank in the line. The improvement was immediate, in fact it was so immediate, that the writer was unable to wait for the first set of dies to wear out and left. Later a report was sent to him, part of which is reproduced below.

✦ ✦ ✦

THE die sizes at the beginning of the run and after 55 hours of continuous operation were as follows:

| New Setup | | After 55 hours |
|---|---|---|
| 1st Draft | — .048 | .0482 |
| 2nd " | — .043 | .0432 |
| 3rd " | — .038 | .039 |
| 4th " | — .034 | .035 |
| 5th " | — .031 | .0325 |
| 6th " | — .028 | .029 |
| 7th " | — .025 | .026 |
| 8th " | — .0225 | .0238 |
| 9th " | — .0205 | .022 |
| 10th " | — .0185 | .0202 |

✦ ✦ ✦

AFTER 55 hours of operation, the last three dies were replaced and the machine run another forty-eight hours before the wire again went out of round.

✦ ✦ ✦

THIS improvement in die life relieved a serious "bottleneck" in the die room and also resulted in a very substantial improvement in production.

✦ ✦ ✦

WHILE increased die life and its effect in stepping up production is important, another very significant factor is the quality of the wire which it is possible to produce with phosphate coatings. In all of the mills where production tests have been run the appearance, uniformity and quality of the product have always been considered excellent.

✦ ✦ ✦

LABORATORY research work continues on this problem and it now appears possible to build up thicker and heavier phosphate coatings than previously attained. With heavier coatings, better rust prevention, more lubricant absorption and better drawing characteristics should be obtained. From the results already accomplished and further production tests which are now being arranged in other mills, there is every indication that these coatings will make a definite contribution in wire drawing by increasing die life and the quality of the wire which is produced.


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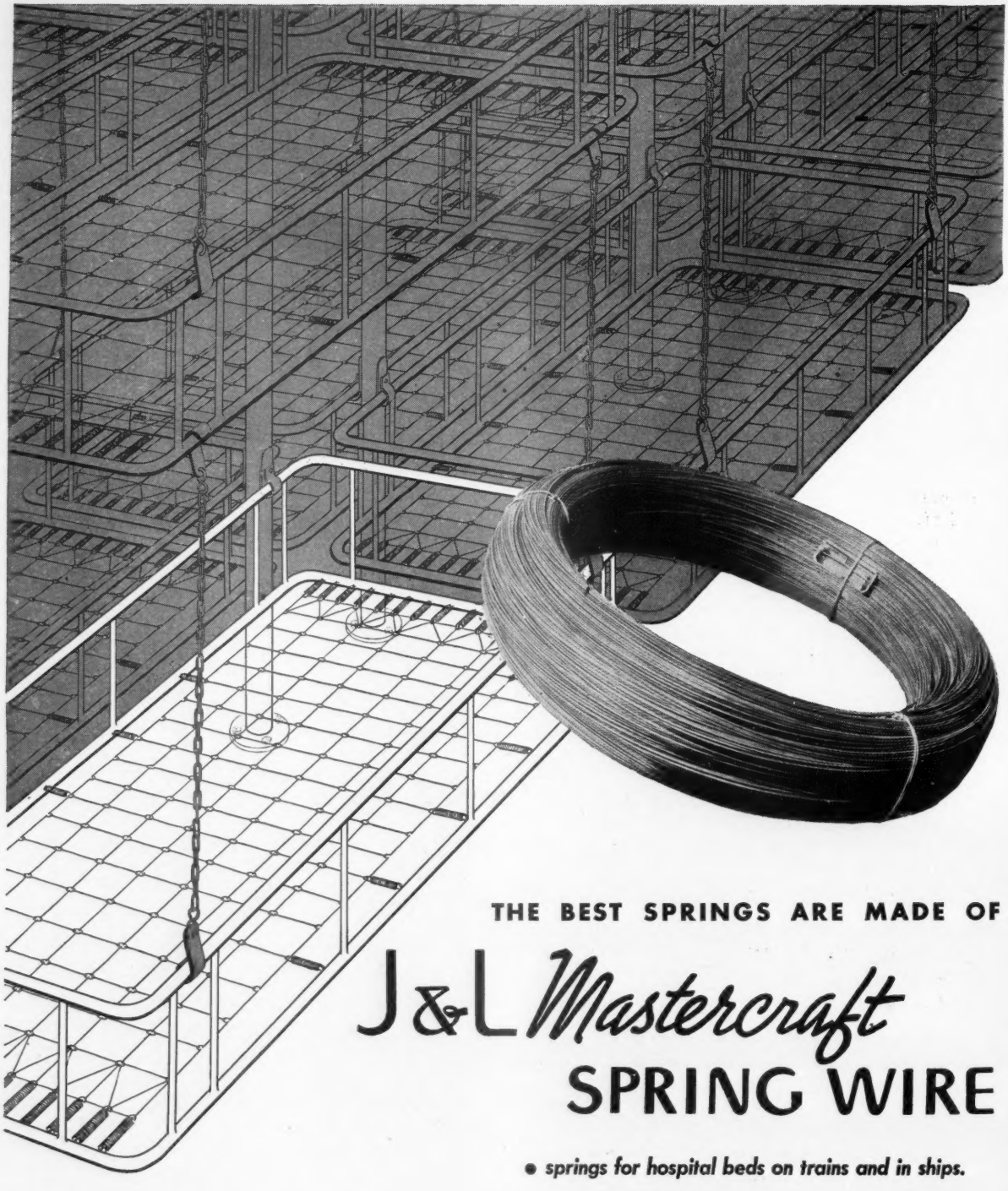

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# Nylon for Silk

By E. B. Wood

Transmission Apparatus Development

WHEN Joseph Henry wound his first electromagnet, the wire he used was insulated with silk. That was over 100 years ago, and ever since, silk has been used for wire insulation in spite of its high cost and the frequently uncertain supply during periods of unsettled trade conditions. Silk possesses a unique combination of properties that has made its continued use desirable in some fields and essential in others.

✦ ✦ ✦

FOR telephone equipment, silk insulation has been employed on two major classes of wire: "switchboard wire," which is used either as individual wires or in the form of cable to interconnect apparatus and equipment assemblies, and "magnet wire," which is used for coil windings. These two classes of wire differ widely in their physical requirements, and employ entirely different types of silk.

✦ ✦ ✦

SWITCHBOARD wire, which is made in conductor sizes from No. 14 to No. 24, has used a comparatively heavy silk yarn wrapped in a double layer over the conductor and then covered with a layer of cotton. This silk in more recent years has been a comparatively cheap grade — spun both from the short lengths that result when the moths eat their way out of the cocoons, and from other waste fiber accumulated in processing.

✦ ✦ ✦

FOR the silk-insulated magnet wires, on the other hand, it has been necessary to use the finest and most expensive grade of continuous-filament silk.

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BELL LABORATORIES RECORD

FOR a number of years the Laboratories and the Western Electric Company have been actively engaged in an effort to replace silk with domestic substitutes. With the unsettled world conditions that developed in the later '30's, this effort was intensified with the result that in 1940 most of the silk used for the switchboard type wires was replaced by cellulose acetate rayon yarn.

✦ ✦ ✦

MAGNET wires, in general, use several types of insulation, including enamels and textiles. In the communication field, much of the magnet wire is in small sizes, such as No. 30 to No. 42, and the insulation must meet special requirements. To obtain the required electrical coil-constants, the insulation must be as thin as is practicable so that a large number of turns of wire may be wound in very small space. It must also be extremely uniform in size and quality so that coils may be made in large quantities within precise limits. Most important of all, the insulation must be free from impurities that might cause electrolytic corrosion, with resulting open circuits in coil windings.

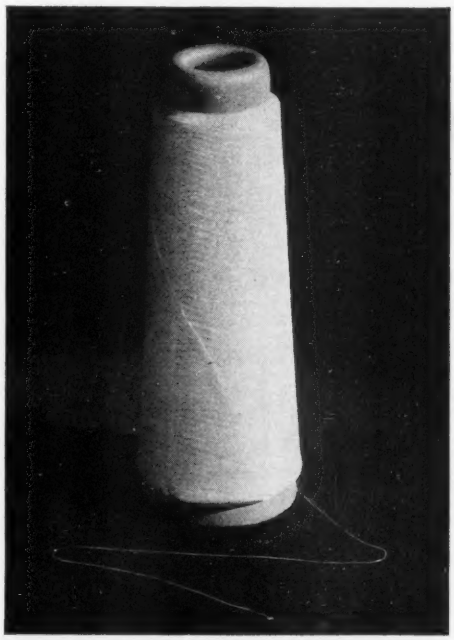

Fig. 1. ✦ ✦ ✦ ✦

E. B. WOOD

**The author, E. B. Wood, was graduated from Princeton University in 1915 with the B.S. degree and received an A.M. there the following year. He served overseas during the war as a captain in command of a battery of coast artillery. On returning he taught physics for a year at Pratt Institute and then joined the Laboratories in 1920. Here his work has been largely on central office wire, cable and cords, and has been active in the development of purified textile insulation and cellulose acetate treatment. In this connection he has developed methods and apparatus for the precise control of humidity.**

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HIGH grade enamel insulation meets these requirements to a considerable extent, and enamelled wire has found extensive application in communication coils. An enamel covering alone, however, is not sufficiently free from imperfections to meet the performance requirements necessary for many types of precision high-frequency coils. In some applications, also, enamel cannot be relied upon to withstand the combined effects of heat, pressure between turns in the winding, and applied voltage; and, as a result, it has been found necessary to add the protection of a textile covering.

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FOR these reasons it has been necessary to retain silk for those uses where enamels alone were not satisfactory, and where very thin high-grade insulation was needed. The silk for this purpose was carefully selected for purity, uniformity and freedom from broken fibers or other imperfections.

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WHEN silk was used on wire, it was applied by wrapping it around the wires at high speed with-

out spacing or overlap to form a smooth single layer less than one-thousandth of an inch in thickness. This was called "serving" the silk on the wire. In other cases the silk was applied in two layers wrapped in opposite directions. In still other cases the silk was applied over enamel to give greater dielectric strength.

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THE material for this use must be strong, light, and flexible, and must have the proper elasticity in addition to good electrical properties. Cellulose acetate rayon, although of satisfactory insulating value, could not be applied in the fine size required for magnet wire insulation and at the high speeds employed, without excessive breakage of the fibers. Other commercial rayons were investigated, but these were even less promising because of similar breakage difficulty, inferior electrical characteristics, poor heat resistance or other limitations.

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IN 1932, after Carothers and Hill of the duPont Company had published a series of articles on condensation superpolymers and their preparation, engineers of Bell Laboratories recognized that these materials had properties making them of probable interest for wire insulation; and an investigation of their use for such a purpose was begun.

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WHEN the duPont Company, in 1938, announced the development of yarn of one of these condensation superpolymers, which they called nylon, the Laboratories at once obtained samples to test for wire-insulating purposes. The preliminary test results were so promising that a program of investigation looking toward the use of nylon as a general substitute for magnet-wire silk was initiated.

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TEST runs by the Western Electric Company showed that nylon could be applied to all the commercial sizes of magnet wire, at standard insulating speeds, to produce coverings closely approximating in thickness and smoothness those obtained with silk. Also it was found that, in general, nylon-insulated wire could be used in coils in place of the standard silk-insulated wire without any changes—in coil design information, so that from the point of view of production, nylon could be substituted directly for silk.

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IN the meantime, the Laboratories were making an extensive investigation of the electrical and chemical properties and the chemical stability of nylon yarn in comparison with silk under adverse aging conditions. Also, comparative studies were being made of the performance of representative types of coils wound with nylon wire and the standard silk-insulated product, with respect to electrical characteristics, aging properties, and corrosion tendencies under severe conditions of temperature, humidity, and voltage. As a result of these studies, the conclusion was reached that nylon yarn, as represented by the samples studied, was superior to silk in insulation resistance and in protection against electrolytic corrosion of copper. Its aging properties appeared satisfactory, and its dielectric characteristics were considered acceptable for its use in high-frequency coils. Nylon yarn was accordingly approved by the Laboratories as a general substitute for silk for magnet wire insulation on January 7, 1942.

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AS soon as war with Japan was declared, it was recognized that silk imports would be cut off, and the OPM, now the WPB, requested the magnet-wire industry to find or develop a substitute for magnet-wire silk. A meeting of representatives of

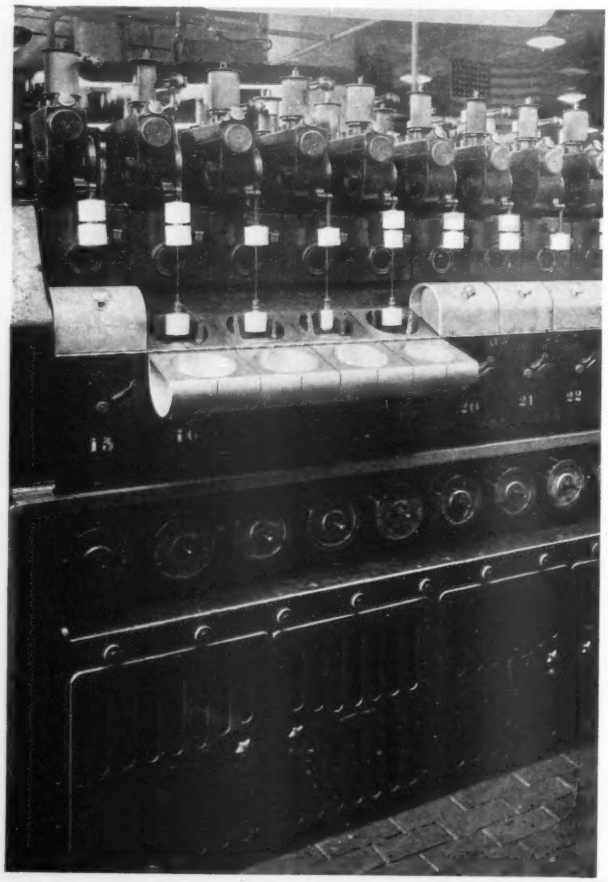

**Fig. 2. One end of a magnet wire insulator which simultaneously applies nylon yarn insulation to twenty-eight wires at the Kearny plant of the Western Electric Company. From spools of enamelled wire on horizontal spindles on the lower part of the machine, the wires are carried vertically up through "packages" of multiple nylon yarn, which is wound around the wire at high speed. The wires thus insulated are carried through reserve packages, which are used successively as the yarn on the preceding package is exhausted, and thence to take-up spools at the top. The multiple thread packages are wound from single thread supply cones similar to the one shown at the head of this article.** ✦ ✦

the silk suppliers, the magnet-wire manufacturers, and the Defense Supplies Corporation was held January 15, 1942, and a committee was appointed to carry out this work. Representatives of the Laboratories and the Western Electric Company attended this meeting, and as a result of the work that had been done already, were in a position to offer definite recommendations for the use of nylon yarn as the only satisfactory substitute for magnet-wire silk that could be applied successfully with existing insulating machines and methods. The Laboratories and the Western Electric Company made available all their technical information on the use of nylon yarn for this purpose and later furnished the requirements used in the specification for magnet-wire nylon yarn adopted by the industry and the departments of the Government.

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THE initial requirements specified by the Laboratories called for a nylon yarn made up of twenty individual filaments. This yarn, which had been furnished for the initial experiments, was closely equivalent to silk in filament size, softness, and handling properties. The filament size of this yarn was smaller than that of yarn manufactured for fabrics, and since the finer filament required considerably more production capacity per unit weight of yarn, it was necessary to consider yarn of larger filament size because of the great demand for this material for special war purposes. Samples equivalent in over-all size to the twenty-filament yarn, but made up of seven, ten, and thirteen filaments respectively, were investigated. The thirteen-filament material was considered usable, and was adopted as standard under the specification. The larger filament yarns were unsatisfactory for two reasons. First, they were too stiff, and in wrapping them on fine wires there was a tendency for the conductor to wrap itself around the insulation instead of the insulation being wrapped smoothly around the conductor. Furthermore, the larger, stiffer filaments did not lie as smoothly and closely, and the wires were oversize.

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IN the manufacture of nylon yarn, molten nylon is forced out through tiny holes to form fine filaments, which become solid on striking the air. The desired number of filaments is then grouped together to form the yarn. This operation is called "spinning." To lubricate the fibers during the spinning operation, and to prevent them from becoming tangled due to the effects of static electric charge, it is necessary to apply to the fibers an oil or similar material called a "finish." Also, it may be necessary to add a similar material later during the operation of winding the yarn into suitable forms, known as "packages," for use on the insulating machines that apply the yarn to the wire. It is necessary that the finish materials used on the nylon shall in no way have a deleterious effect on the insulating properties of the wire covering or upon the other parts with which the wire comes in contact. As a result of the Laboratories' cooperative work with the manufacturer, a spinning finish was developed which, according to the results of exhaustive electrical and chemical tests, is free from any appreciable deleterious effect on the insulating value of nylon yarn. Also the Laboratories recommended the specific material to be used for any additional finish required in subsequent winding operations. Requirements and test procedures were set up to detect any significant deviations in these finishes that might affect the insulating quality of the yarn. These have been included in the general nylon specification noted above.

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MANY of the wartime substitutions necessitated by scarcity of materials or cessation of imports have been authorized only on a temporary basis, until supplies of the standard materials are available. The substitution of nylon yarn for silk as magnet-wire insulation, however, has been adopted by the Bell System as a permanent change, since the evidence appears conclusive that nylon will continue to prove the better material for this use.


# THE 1945 REGIONAL MEETINGS

The Annual Worcester and Pittsburgh Regional Meetings originally scheduled for April and May, respectively, will not be held this year, as the Directors have deemed it advisable to cancel them in conformity with the request of the Office of Defense Transportation in Washington, D. C.

While it is possible to hold technical sessions bearing on the war production problems by securing permission, it has been considered wiser to conform to the spirit and necessities of the war situation and plan for better meetings later on when conditions are more auspicious.

**THE WIRE ASSOCIATION**

Richard E. Brown, Executive Secretary

300 MAIN STREET STAMFORD, CONN.

# Employee Selection in the Metallurgical Industry

A Correlated Abstract (F.R.M.)

MANPOWER shortages have made necessary the taking over of women and other people who were not considered physically fit for this heavy industry. Absenteeism, and job shifting present problems to industry because of the time and cost involved in the training for a particular job.

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IT appears that a method could be worked out which would make it possible to train a new employee for a job for which he or she is physically fit, and in which he or she will be happy. This requires evaluation of the job and determination of the physical and psychological characteristics required.

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THIS abstract is intended to give the high lights of the work done in the field in Germany in the last seven years, five of which have been war years.

SCHULZ in 1937 (Stahl und Eisen, vol. 57, pp. 1133-1142) presented a summary of the status of employee selection at that time.

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THE choice of personnel was started by **Holmgren** about 50 years ago. He tested railroad locomotive engineers for color blindness. **Taylor** at about the same time, started his work of rationalization of industry. By means of time and motion studies this has developed into the modern assembly lines and mass production. Not until recently have employers, managers and personnel directors realized, that the above are not enough, although they improve efficiency. A man for a job must have an **inner calling** for that job, and it is only then that this man will be at his best efficiency himself. If all men are more efficient, not only will workers benefit, but industry and the national economy of the country in general.

PSYCHOLOGISTS have worked out a so called **structural** psychology. Its aim is to show the structure of the soul because in it are grounded the differences of character. Differences in talent are also structural differences. There are a number of structures or biological dispositions and they are characterized by certain marks (capacity for experience, will, character, talent, etc.) These dispositions are present in all races although in varying degrees.

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HOW can these structures be measured or determined? One method consists in handling the person to be analyzed a number of pictures with the request to pick out the one which appeals most to him, and to express himself in writing on that. From WHAT he says and in the WAY he says it data can be gathered on his perception, imagination, sensitivity to experiences, feeling, thinking and expression (use of language).

**TABLE I**
**Fundamental Attitudes and Dispositions**

| GROUP | DISPOSITIONS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Attitude | Perception Imagination | Experience Feeling | Thinking Expression | Movement Pace | Will | Attention | Reaction to Outer World | Social | Health Vitality |
| I Reality | Objective to the point | temperate reserved | empirical practical simple | constant tight sure | Perseverant stable settled | long concentration will-control | not influenced outside world | to equal kind practical | Excellent. |
| II Values Ideals condition | Ruled by world values† ideals | Interests conditioned by value | sensible thinking animated, organic | Between I and III | Set on wide goals. In practical cases changes possible | Between I and III | Often socially inclined | stress ideal traditions | ↓ |
| III Open to World. Feeling | Intuitive Comprehensive view | talented strong feeling with† for . . . | not logically inclined picturesque feeling accentuates | elastic turning, quick to reaction | elastic | Attention easily aroused | takes easily to new situations. Influenced | Common feeling with community (artistic) | susceptible to dangers outside |
| IV Subjective, active transposable. | Wide field Quick Lively | Very active phantasy. Very jumpy | Original lacks in objectivity depth† logic | fine nerve impulsive quick to react | not settled. Depends on impulses | Wide field | easily accommodated | tendency for collectivity | ↓ |
| V Subjective Active Ruled by intellect | (ditto) (ditto) ruled by intellect | controlled by intellect Rational Conscious | Comprehensive, Constructive rational (danger of formaliam† intellectualism) | changeable under control, quick to react | In general not settled Depends on interest in goal | Bound by interests Very transposable | Capacity for accommodation† changes. Insecure when reasonable fundamentals fail | Danger of Individualism | Susceptible to maladies of body and soul. |

THE second method consists in having the person press two handles repeatedly in his hand until he is really tired. His pressures, their intensity and their frequency are registered automatically and so called "ergograms" are obtained. Their interpretation gives the degree of will, constancy or pace of movement (psychomotorism) and attention.

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WITH other additional data from other methods a chart (Table I) of fundamental attitudes and their correlation with the summation of disposition may be made. The arrows at the left hand side show that intermediate grades are possible. Each person has:

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1. A certain fundamental attitude (sense of value, style of expression)
2. A certain capacity for experiences from the outside world (people, matter, work)
3. A certain conduct of the will (character)
4. A certain talent or ability
5. A certain personal velocity (or pace)
6. A certain psychomotorism (or lapse of movement) etc.

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THE application of the above to the selection of employees for various callings is to be made as follows. Analyze the job and see what requirements it has. If the requirements for the job and the fundamental attitude and the disposition of the man agree closely, the man will make a success of the job. For instance, an analysis and summary of the requirements of the MINING and METALLURGICAL INDUSTRY shows that people of group I are the best adapted. Technicians and foremen should be sought preferably amongst people having the disposition of group II. See Table II.

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IN Table III are listed callings which have requirements corresponding to characteristics of group I.

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PEOPLE in group II have the characteristics or biological disposition indicated in Table IV.

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THE callings which have requirements corresponding to characteristics of group II are listed in Table V.

**TABLE II**
**People in Group I Have the Following Characteristics:**

| |
|---|
| Fundamental attitude is realistic |
| Perception and imagination is objective and to the point |
| They think realistically, they are logical and goal conscious |
| They have capacity for continued concentration |
| Their work is uniform |
| They have uniform time measure, will power |
| Capacity for uniform, even monotonous, work |
| Dependability, singleness of purpose |
| Thoroughness |
| Not easily diverted by outside influences |
| Ready to stake or to leave |
| Stable, calm, directed inwards |
| They are reaction sure |

**TABLE III**
**Group I and Callings**

| Manual | Mental |
|---|---|
| Mining and Manufacture in iron, steel and stone industries: smith, melter, foundry, etc. | Business callings: bookkeeper, statistician (for management) employees for banks and insurance companies. |
| Mechanical work on metals and stones: locksmith, carpenter, turner, tinsmith, driller, miner, mason, betonwork | Academic callings: Mining, metallurgical. naval and construction engineers: naturalist, geologist, chemist, physicist, mathematician, surveyor, pharmacist, lawyer. |
| Coarse work mechanic | Other examples: transport fliers, helmsman, agricultural technologist, forest keeper. |
| Also: locomotive engineer, seaman, and in general callings which require courage and physical strength, mounters, climbers, etc. | |
| Preference is to coarse, rather than fine fitting work | |

**TABLE IV**
**Characteristics of People in Group II**

| |
|---|
| Fundamental attitude is based on value. |
| They think in terms of value, they are reflective, logical, animated and have a tendency to combine (or unit, coordinate). |
| They are energetic and strong, with a resistant will. |
| Especially ready to stake and make sacrifices of a bodily and spiritual nature. |
| They are enthusiastic and socially inclined. |
| Susceptible to world influences but do not become slaves of them. |
| Animatedly and reflectively they stake their mental and intuitive forces. |
| Pulls with all his strength according to value of work (strong professional ethics). |
| They have concentration and sense of proportion, especially in fine and symmetrical work. |

**TABLE V**
**Callings Appropriate for People of Group II**

| Manual | Mental |
|---|---|
| Artistic smith, fine mechanic (construction of tools and machinery, electromechanic) | Business callings: buyer, salesman of iron and machinery, correspondent |
| Special calling for woodwork, in the graphic industries and for fine work on leather. | Academic: educators, physician, theologists, political economist, jurist, etc. |
| | Other typical examples: Personnel work, civil service, soldier, social work, organizer, managing engineer, physical education teacher, ranger, etc. |

TABLE VI
Degree of Capacity Required for the Following "Jobs" in the Metal Industry

| | Open Hearth Operator | Roller | Inspector | Welder | Roll Turner |
|---|---|---|---|---|---|
| **I. DRIVING SOURCE** | | | | | |
| Technical practical interest | 2 | 2 | 2—3 | 2—3 | 1 |
| Pleasure in reflection | 4 | 4 | 4 | 1 | 4 |
| Pride in making | 4 | 4 | 4 | 1 | 1 |
| Precision | 4 | 4 | 1 | 2 | 2 |
| Tidiness | 1 | 1 | 4 | 4 | 4 |
| Pleasure in cooperative work | 1 | 1 | 4 | 4 | 4 |
| **II. INTELLIGENCE** | | | | | |
| Ability to anticipate | 3 | 2—3 | 1—2 | 2 | 3 |
| Ease of grasping | 2—3 | 2 | 2 | 2 | 2—3 |
| **III. WILL and CHARACTER** | | | | | |
| Conscientiousness | 1 | 2 | 1 | 1 | 1—2 |
| Constancy and endurance | 3 | 2 | 1—2 | 1—2 | 1—2 |
| Little mental fatigue | 3 | 1—2 | 2 | 1 | 3 |
| Responsibility for work | 2—3 | 3 | 2—3 | 1—2 | 2—3 |
| Presence of mind | 1 | 1 | 2—3 | 2—3 | 1—2 |
| Psychic timing | 2—3 | 2—3 | 3 | 3 | 3 |
| **IV. SPECIAL INTELLECTUAL FUNCTIONS** | | | | | |
| Technical—theoretical talents | 3 | 2—3 | 2—3 | 2 | 3 |
| Technical—practical behavior | 3 | 2 | 2—3 | 3 | 3 |
| Space visualization | 4 | 3 | 2 | 2—3 | 2—3 |
| Conception of shape, judging of dimensions | 4 | 3 | 2—3 | 3 | 2 |
| Memory perception | 3 | 3 | 1—2 | 3 | 3 |
| **V. MOTORISM** | | | | | |
| Body dexterity | 2 | 2 | 3 | 1—2 | 2—3 |
| Manual dexterity | 3 | 2 | 2—3 | 2 | 2—3 |
| Articulation, ability for detail | 4 | 4 | 2 | 1 | 2 |
| Bimanual dexterity | 4 | 4 | 3 | 2 | 2 |
| Impulse control | 4 | 4 | 4 | 2—3 | 3 |
| Some automatization | 4 | 2 | 2 | 2—3 | 2 |
| **VI. OTHERS** | | | | | |
| Vision | 4 | 4 | 4 | 4 | 4 |
| Color distinction | 2 | 4 | 2 | 2 | 4 |
| Hand perspiration | | | ! | | |
| Physical constitution | 2 | 2 | 4 | 1 | 2 |

Notes: 1—greatest aptitude, best performance, excellent;
4—lowest;
!—perspiring hands detrimental;
body constitution: 1—strong, muscular,
2—average strength, sinewy

SCHULZ concludes that a man has a superior feeling of his own strength, his responsibility and his inner happiness only when he is located in the most suitable calling (or job) to his capacities (or dispositions). In other words, the above is only possible if there is a harmonious integration of all his physical, mental and spiritual forces in the pursuance of his everyday tasks. It is only when man dedicates himself with his whole personality that he will attain the real attitude towards life and work.

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IN the discussion that followed the presentation of the above paper, the following was brought out:

1. Although certain traits may be improved by habit, training, and/or education, the fundamental attitude is not changed. It is inherited.
2. By a proper orientation of the sort indicated above many misfits would be located in their proper place.
3. The recommendation of a manual calling instead of a mental does not mean that the person should not be educated.
4. In view of the socializing trend, it would be worthwhile that all the students in junior high school should be tested for fundamental attitude and capacities, so as to orient them. Funds should be provided to help attain the goal for those students who do not have the financial means but the capacities for certain intellectual callings.
5. Although the percentage of "misfits" could not be reduced to zero, it would certainly be reduced, the amount depending on the attitude taken by parents and guardians on the suggestions made.

TABLE VIII
Report of Observations on Follow-Up of Suitability for Job

| | 1 Zealous punctual interested, with goal | 2 industrious, assidious constant | 3 willing equal, even | 4 slackens, not very interested, requires admonition | 5 capricious, bored, inconstant, | 6 loafing, no interest at all, lazy |
|---|---|---|---|---|---|---|
| Zeal for work interest, industry, punctuality, endurance, constancy | | | | | | |
| Care, cleanliness, order (in notebooks, working clothes, and work place. In the handling of tools and materials.) | | | | | | |
| LEADERSHIP | | | | | | |
| Sociability | | | | | | |
| Anticipate | | | | | | |
| Mental activity | | | | | | |
| Cautiousness, Comprehension, handiness | | | | | | |
| Conscientiousness (exactitude, precision in work) | | | | | | |
| Concentration, Constancy and endurance (little mental fatigue) | | | | | | |
| Independence (sureness) | | | | | | |
| Excitability (presence of mind, calm blooded) | | | | | | |
| Working rate (velocity) Aptitude | | | | | | |

Note: The more completely each degree is expressed in this form, the easier it will be to grade an individual, and the more accurate the general view of his status and of his development. The choice of supervisory personnel may be facilitated. A lapse in the record of an individual will require immediate attention to determine the cause.

BORNEMAN recently (Stahl und Eisen, vol. 64, January 20, 1944, pp 37-47) presented the advances and the problems meeting "Workpsychology" in Germany, especially because of the 5 years in which she has engaged in war. In 1944 it was found necessary to promote "PRIDE IN THE WORK," improve work efficiency and to overcome psychological anti-management sentiment.

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THE problems of work psychology have developed in three stages:

1. Psycho technical qualifications tests
2. Judging personality
3. Psychological job suitability considering especially the requirements of the work.

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THE first stage is based in giving the applicant not only manual tests but also written tests. The latter are so designed as to inquire into his knowledge of the vocabulary in the particular field in which he indicates interest.

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JUDGING the personality of a person is based on the judgment of co-workers or superiors on the applicant's qualifications, and grading them in a suitable questionnaire. The degree (from excellent to very poor, or some equivalent term) is graded in the following:

a) attitude toward practical work (grade on five items)
b) intellectual capacity (6)
c) attitude towards other persons (5)
d) character (interest in work, honesty, carrying through assignments)
e) would the man be recommended for a foreman's place?
f) remarks.

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THE purpose of the last method is to have the center of gravity of the ability of the person coincide with the center of gravity of the requirements of the job. It is expected that all "recognized" industrial jobs may be worked out on the basis of necessary, desirable and excluding properties.

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TO illustrate a few examples are given from the 30 jobs listed by the author. (Table VI.)

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TO assign a person to a job a number of tests are given and they are

*(Please turn to page 150)*

TABLE VII
Suitability Record

**Personal Data**

Date of interview ..... Photograph
Place of interview .....
Vocation desired .....
Name ..... Born .....
Address .....
Education .....

Father's occupation ..... Employed by .....
Father's birthplace ..... Mother's birthplace .....
Number of brothers and sisters .....
Favorite subjects in school .....
Favorite occupation at home .....
Military service and rank, (Boy Scouts, etc.) .....

**Physical data**

Height ..... Body strength .....
Body build ..... Body mobility .....
Development (Physical) .....
Remarks on health .....
Other data (flat feet, hand perspiration, etc.) .....

**Performance data**

**Spiritual ability**

| Abilities required | 1 | 2 | 3 | 4 | 5 | 6 | Results of test | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Anticipate, understanding, ability to think | | | | | | | Problem in organization | | | | | | |
| | | | | | | | Behavior in a pinch | | | | | | |
| | | | | | | | Critical thinking | | | | | | |
| | | | | | | | Recognition of essentials | | | | | | |
| Ease of grasping general view | | | | | | | Instruction box | | | | | | |
| | | | | | | | Eliminate numbers | | | | | | |
| | | | | | | | Read scales | | | | | | |
| Vocabulary | | | | | | | Fill blanks | | | | | | |
| Technical constructive ability | | | | | | | Complete technical problem | | | | | | |
| | | | | | | | Displacement model | | | | | | |
| Space visualization | | | | | | | Build with cubes | | | | | | |
| Shape conception judging of dimension | | | | | | | Wire bending test (form) | | | | | | |
| | | | | | | | Figures and values | | | | | | |
| Memory, perception | | | | | | | Reproduction of present (extent) | | | | | | |
| | | | | | | | Figures and values | | | | | | |

**Will Capacities**

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conscientiousness, exactitude, dependability | | | | | | | Bourdon | | | | | | |
| | | | | | | | Sorting problem | | | | | | |
| | | | | | | | Folding test (accuracy) | | | | | | |
| Little mental fatigue | | | | | | | Adding | | | | | | |
| | | | | | | | Ergometer | | | | | | |
| | | | | | | | Folding test (resistance) | | | | | | |
| Constancy and endurance | | | | | | | Hold 110 (88) lbs. | | | | | | |
| Speed of reaction | | | | | | | Falling sticks | | | | | | |
| Presence of mind | | | | | | | Addition | | | | | | |
| Working speed | | | | | | | Insert sticks | | | | | | |

**Manual and Body Dexterity**

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Body strength and mobility | | | | | | | Gymnastic exercises | | | | | | |
| | | | | | | | Wire wrapping test | | | | | | |
| Manual dexterity | | | | | | | To displace body | | | | | | |
| Ability for detail | | | | | | | Folding test | | | | | | |

**Senses**

vision left ..... right .....
Color .....
Hearing, left ..... right .....

Conclusions: .....

Date ..... Signature .....

## Stop that thieving demon RUST with new

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***Shell Ensis Rust Preventives*** embody a complete line of oils, fluids and compounds. They are available in various grades and provide protection against the dangers of exposure. Their protective coatings range from thin, transparent films for indoor use to heavy, abrasion-and-weather-resistant coatings for outdoors.

***Shell Tellus Oils*** do not *remove* rust . . . However, where moisture is a factor, special rust-inhibiting qualities built into them afford protection against the formation of rust, without sacrifice of other valuable characteristics.

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**SHELL Tellus Rust Preventive Lubricating Oils**

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# Carbide Mandrel Effectiveness Increased by Proper Application and Maintenance

By Earle Glen
Sales Engineer
Carboloy Company, Inc., Detroit, Mich.

THE greatly increased use of carbide mandrels and dies for the drawing of steel, brass, bronze, aluminum, cupro-nickel, stainless steel, etc., tubing during the past few years —in sizes ranging all the way from .125″ I.D. to 3″ and greater I.D.—has brought with it the need for a wider understanding of the importance of the corect application and maintenance of these tools. Proper pointing of the tube ends; frequent and thorough annealing of the tubes; careful pickling and cleaning; correct draw-bench alignment; etc., are all important items to consider in order to obtain the better inside finish, closer tolerances on long runs, more continuous operation, and fewer rejections which the use of carbide mandrels can give.

✦ ✦ ✦

IT must be remembered that a carbide mandrel is essentially a precision tool, and that it must receive the same care and consideration accorded to any other precision tool in order that it may continue to function properly. However, the proper care and application of a carbide mandrel is no more complicated or difficult than is the use of any precision tool used on production work. In fact, it involves little more than close attention to the various details involved in correct tube drawing procedure in general—details which should be observed even when using conventional chrome-plated steel mandrels.

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WHEN using carbide mandrels, for instance all tubes—no matter from what material they are made —should be pointed in such a manner that the reduced portion of the tube blends into the larger diameter with a **radius,** rather than an **angle,** (see Fig. 1). This lessens the shock on the carbide nib. It is well to pickle all hot pointed stock (brass and copper are usually pointed cold; steel is usually pointed hot) to remove the scaly crust resulting from the heating operation. The pointed end should be open, to avoid air pockets and permit a free flow of acid and lubricant throughout the entire inside surface of the tube.

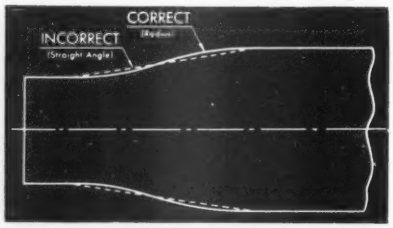


**Fig. 1. Pointed end of tube must be open to permit free flow of acid and lubricant.** ✦ ✦

YEARS of experience in the use of carbide mandrels for tube drawing have shown that maximum mandrel life and optimum economies can be obtained only when all tubes are properly annealed. The best practice is to anneal the tubes **after each pass.** When tubes are spotty, too hard, or otherwise improperly annealed, they exhibit a tendency to chatter while being drawn. This chattering will result in pickup and scratches on the interior of the tubing, and will also cause excessive heating of the mandrel. Excessive heating, in turn, results in a strain on the carbide nib with a possible development of small surface cracks and subsequent possible mandrel failure. All in all, good annealing practice pays dividends in lengthened mandrel life; lower costs; and more continuous operation of the draw-bench.

✦ ✦ ✦

BOTH the pickling and the cleaning operations should be watched carefully to avoid scratches on tubing which may put excessive pressure on the mandrel and ultimately cause failure. It has been shown time and again that a single bad tube can greatly shorten the life of a carbide mandrel.

✦ ✦ ✦

IT has been found helpful to have a light etch—rather than a smooth surface—on the tubing. This holds the lubricant better, thereby providing a more uniform drawing surface which reduces friction and prevents pickup and scratches. Etching too deeply, however, should be avoided since this causes "acid burn" which may be harmful to the mandrel.

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AS mentioned, correct lubrication is an important factor in the drawing operation. Improper lubrication results in metal to metal contact creating excessive heat which leads to an eventual breakdown of the lubricant. When such a breakdown occurs, the mandrel picks up and scratches the tubing. Where pickup takes place, the excessive heat generated (often actually turning the mandrel blue) may cause surface cracks to appear on the carbide nib followed by dislodging of small carbide particles and eventual mandrel failure.

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A satisfactory lubricating practice is to place the back end of the tube in the tank first and then gradually submerge the entire tube. This action expels all of the air and permits complete coverage of the lubricant over the inside surface of the tube. If the pointed end of the tube is closed, it should be cut off and re-pointed so as to provide an opening for the air to get out of the tubing. Otherwise, air pockets will form and prevent the lubricant from covering the entire inside surface.

AS to draw-bench alignment—it is important to have the die accurately lined up with the grip-and-pull carriage in order to draw the tube on-size and straight. Improper alignment will result in bowed and off-size tubing. Correct alignment of the **mandrel rod** is also important. This rod should be in line with the die since an off-center mandrel rod puts unnecessary strains on the mandrel, especially as the back end of the tube is passing over the mandrel.

✦ ✦ ✦

WHEN setting up the mandrel, care should be taken to set the mandrel in the correct position in the die. Tapered and straight mandrels require slightly different practices, as is illustrated in Figures 2 and 3.

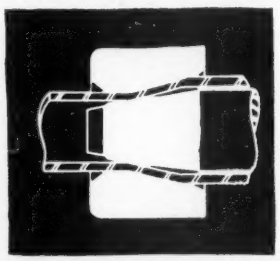

**Fig. 2. Set tapered mandrel into die just far enough for correct size.** ✦ ✦ ✦ ✦

THE tapered type of mandrel should be set just far enough into the die to obtain the correct size (Fig. 2). In this case, special care should be exercised to see that the tubing does not start to reduce on the steel shank in back of the cemented carbide nib. Wear marks after drawing will show if this is taking place. Experience to date indicates that tapered mandrels are more efficient than straight ones. The taper automatically provides clearance of the point after the indise diameter of the tubing has been sized. The area of contact is also reduced, which helps in maintaining efficient lubrication.

✦ ✦ ✦

WHEN setting up the straight mandrel, it should be set into the die so that the end of the chamfer on the mandrel extends slightly past the bearing (see Fig. 3). When properly set, the surface of the mandrel will show evidence of contact with the tube at from 5/16″ to 3/8″ from the end of the chamfer on the mandrel. If the mandrel is extended too far through the die, an excessive area of carbide will be in contact with the interior of the tube. This condition will cause pick-up due to unnecessary friction and strains on the mandrel. On the other hand, if the mandrel is not placed far enough into the die, it will be impossible to get the tube to start.

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IT is the experience of the largest users of carbide mandrels that maximum efficiency is obtained only by servicing them at predetermined and regular intervals rather than waiting until they "appear" to need servicing. Regular servicing results in better tubing, reduced operating costs, and longer over-all mandrel life.

✦ ✦ ✦

"RINGS" and wear marks should be removed as soon as they are formed. These rings and wear marks (Fig. 4) develop after considerable use on the carbide mandrel at the point where tube reduction starts. The mandrel should be serviced as soon as they become visible. If rings and wear marks are permitted to become too deep, they tend to remove all lubricant from the tubing. When this happens, the tubing will pick-up and scratch. Eventually small particles of the carbide mandrel nib will pull out.

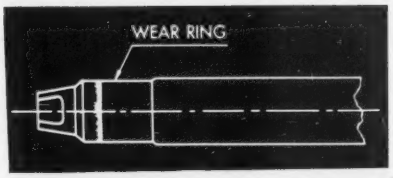


**Fig. 4. Always service mandrel at once when rings and wear marks develop.** ✦ ✦ ✦

✦ ✦ ✦

A straight type mandrel, which has worn undersize may be "salvaged" by re-setting the mandrel further into the die. Before doing so, however, it is important that a recess be ground into the mandrel nib (see Fig. 5) so as to avoid too great an area of contact with the tube.

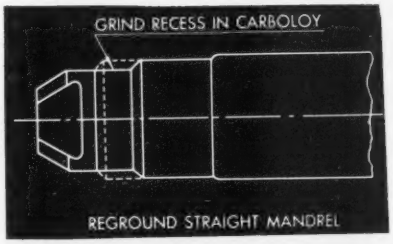


**Fig. 5. When straight mandrel wears undersized, grind recess in nib as shown.** ✦ ✦

IN drawing steel tubing it is important to maintain a sharp edged chamfer on the front end of the mandrel nib. When this chamfer becomes rounded over, the mandrel will not immediately "bite" into the tubing. When this occurs, no reduction in wall thickness takes place for some 6″ to 8″ during the first draw. This means that in the following drawing operation, the mandrel must take a double reduction at the start, as is indicated in Fig. 6. The sudden jerk which occurs when the point of normal reduction is reached places an excessive strain on the carbide mandrel.

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IN case of a double reduction, the tube should be cut off beyond the area of the double reduction and then re-pointed. A sharp chamfer may be

*(Please turn to page 158)*

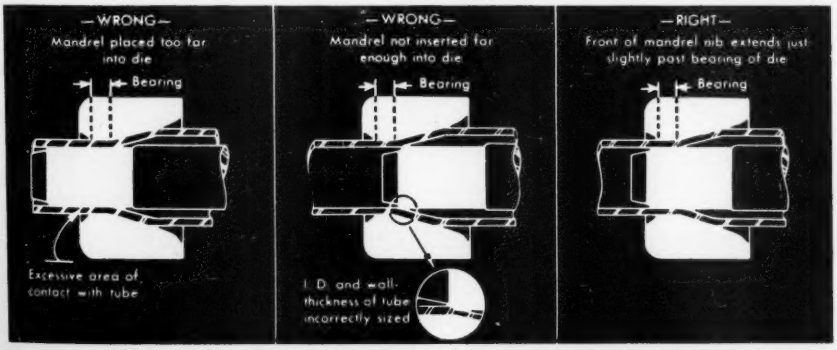
—WRONG—
Mandrel placed too far into die
Bearing
Excessive area of contact with tube
—WRONG—
Mandrel not inserted far enough into die
Bearing
I. D. and wall-thickness of tube incorrectly sized
—RIGHT—
Front of mandrel nib extends just slightly past bearing of die
Bearing

**Fig. 3. Set straight mandrel into die so that end of chamfer extends just slightly past bearing.** ✦

# Shortage of Field Telephone and Telegraph Wire for Military Purposes

A critical shortage of tactical field telephone and telegraph wire in all theaters of operation is anticipated unless unfilled orders are quickly supplied, according to Signal Corps officers who are supervising wire procurement schedules.

✦ ✦ ✦

THESE officers compare the wire shortage to that of artillery ammunition and point out that effective artillery fire is impossible without direct and adequate communication. They also point out that, when security demands radio silence, the direction of all military operations depends on wire.

✦ ✦ ✦

WIRE in effect is the nerve system of the Army. It is necessary in order to provide communications between tactical Army units and to maintain contact with their headquarters and supplies and between command posts. As troops move on to new positions new lines must be laid with Signal trucks reeling out thousands of miles of wire each day. Rapid advances on wide fronts and unforeseen rates of wire destruction due to armored vehicles and shell fire have boosted requirements for communication wires to unanticipated levels.

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A brief description of the three types of tactical wires for which greater production is required is as follows:

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### Assault Wire

ASSAULT wire (W-130), an extremely light wire, is strapped on the backs of Signal Corpsmen in reels and carried to the most advanced posts. It lies exposed on the ground as the bearer crawls cautiously to within seeing distance of the enemy to transmit information about the foe and often to direct artillery fire. Because it is intended only for temporary use it is considered expendable. It consists of six finely drawn strands of galvanized steel wire (to give it strength) and one of tinned copper, stranded together, lightly insulated, and the conductors twisted together.

✦ ✦ ✦

### Field Wire

FIELD wire (W-110B) is a heavier product. This is the most widely used of all tactical wires, one of its functions being to maintain communication from the rear to company headquarters. It is designed to last many times longer than assault wire. It, too, is considered expendable, but when possible it is salvaged and reused. It consists of two conductors twisted together, each comprising three strands of copper wire and four of high strength steel, insulated, cotton covered, and weather-proofed.

✦ ✦ ✦

### Long Range Communication Wire

LONG-RANGE communication wire (W-143), is a much heavier, all-copper wire designed for communication over distances greater than the range of W-110B, and used where other more permanent communication systems are not available.

✦ ✦ ✦

SPECIAL facilities, in addition to existing commercial wire facilities, have been necessary for all three types. In the case of W-110B, as a result of advance planning by the Signal Corps, facilities have more than tripled and production more than quintupled since Pearl Harbor. Long-range wire W-143 is a comparatively new development by the Signal Corps and production became sizeable only this year. Military requirements for all three types, as stated in the foregoing, have increased much more rapidly than it was possible to expand and man facilities to produce them.

✦ ✦ ✦

IN the middle months of the current year it became necessary for the Army Service Forces to ration these Communication Wires. During November, production of W-130 met only 78%, W-110B only 81%, and W-143 only 77% of the demands exclusive of amounts needed to provide a safe stock level. Unless production is drastically increased, supply will be even more inadequate to meet demands in the coming months.

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IN order to obtain maximum production of the above wires, the Signal Corps, Army Service Forces, have taken the following steps:

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**1. Specifications were revised wherever feasible in order to reduce facility bottlenecks and alleviate raw material shortages. The outstanding limitation in W-110B production is, and has been, the supply of galvanized high carbon steel wire. Specifications were relaxed in order to permit the use of a limited quantity of a lower grade steel wire found to be available from an unshipped Lend-lease source. Facilities to strand the wire became a bottleneck and a strand construction change was authorized in order to permit a greater output per machine. The supply of cotton yarn for the braided wire covering became critical and temporary specification revisions were made to permit a more open braid using less cotton and, where necessary, the use of rayon in limited amount was authorized. Industry has been extremely helpful in proposing design changes which would tend to speed up production and each proposal, after careful consideration, has been adopted where the required performance of the wire for military use permitted.**

*(Please turn to page 150)*

# GOVERNMENT WIRE PRODUCTION INFORMATION

**The War Production Board today issued a report on the metals and minerals industry's production record in 1944. The data following is taken from that report.**

✦ ✦ ✦

## Steel

OVERSHADOWING the whole steel picture is the manpower shortage. Based on the "must" requirements of the Armed Services for such steel products as shell steel, wire rope, communications wire and castings, additional manpower must be channeled to the steel industry.

✦ ✦ ✦

OVERALL steel demand in the first two quarters of 1945 as estimated by claimant agency requirements is expected to be unchanged from the fourth quarter 1944 estimate when carbon and alloy production of around 16,000,000 tons balanced essential needs. However manpower shortages and overtaxed facilities may put a number of steel products in the critical group.

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THE revised view of the war's probable duration is evidenced by the Army's stepped up demands for carbon shell steel extending throughout 1945. Shell steel production is expected to reach 400,000 tons monthly at the end of 1945. A large part of the additional tonnage will be needed for 105 mm. and higher caliber shells.

✦ ✦ ✦

STEEL mill schedules must be reshuffled somewhat to accommodate the ammunition program. Increases in shell billets and other types of steel for this program will cut into first quarter output of quality carbon bars, semi-finished, rails and structural steel at some mills. Quality "hot topped" steel will be in increased demand for this program which may reduce supplies of quality steel available for the seamless pipe and tube mills.

✦ ✦ ✦

THE fluid character of the warfare on the European front has used up communication wire at a rate far beyond calculated expectancy. With scheduled 1945 requirements of assault, field and tactical communication wire running 30 per cent over 1944, these products are expected to continue on the critical list throughout the greater part of the year.

✦ ✦ ✦

PRODUCTION of wire rope and strand, another critical item has shown improvement for three successive months and recently topped the previous 1944 peak production established in May. However, military demand for wire rope and strand is expected to keep this product on the critical list throughout 1945.

*(Please turn to page 138)*

MICROMETER PRECISION MICRO-WELD TRADE MARK REG. U. S. PAT. OFF.

**CONTINUOUS IMPROVEMENT**

MICRO-WELDERS with dial indicating annealing attachments are now available for high carbon wire.

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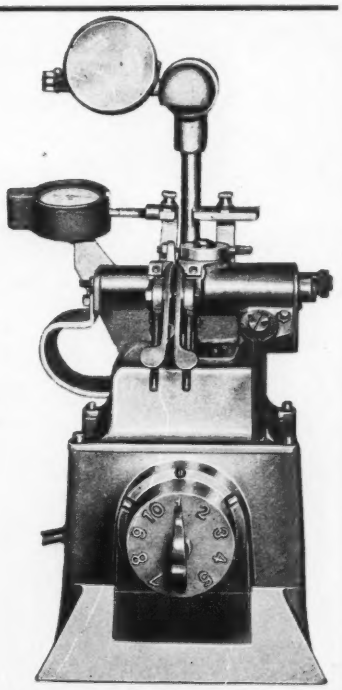

**MICRO PRODUCTS COMPANY**

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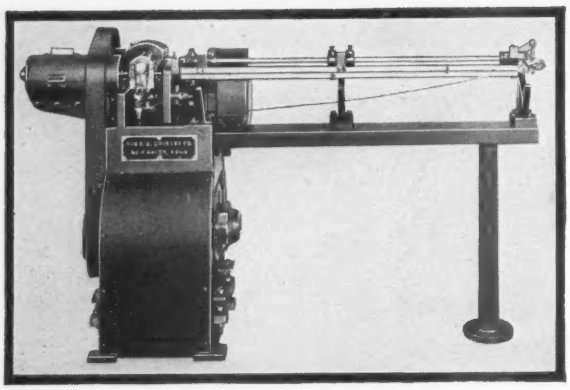
Telephone, State 7468



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Wire Capacity 1/32" - 1/16" Diameter

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**GREATER PRODUCTION!**

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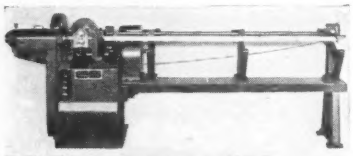
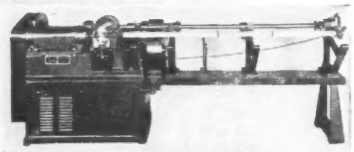
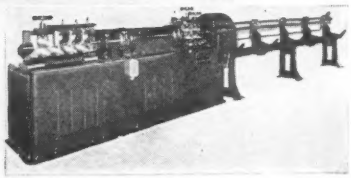


Type 1A
1/16" - 3/16"
Dia.



Type 2A
1/8" - 1/4"
Dia.



Type 3A
3/16" - 3/8" Dia.

Type 4A (not shown)
3/8" - 5/8" Dia.

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SHUSTER
*Automatic*
WIRE STRAIGHTENING
*AND CUTTING*
MACHINES
*Since 1866*

## Government Wire Production Information

*(Continued from page 137)*

### Copper

ESTIMATED total refined copper production available to the United States in 1944 was 1,780,000 short tons, or only two per cent below the record year of 1943.

✦ ✦ ✦

WHILE the production rate climbed in 1942 it declined in 1944 because of manpower shortages. Imports accounted for 38 per cent of the total copper supply in 1944 as compared with 34 per cent in 1943 and 37 per cent in 1942.

✦ ✦ ✦

DOMESTIC mines and plants, including fabricating plants, were severely drained of their manpower during the year so that the mine production rate at the end of 1944 was only 76 per cent of the March peak.

✦ ✦ ✦

THE outlook for 1945 domestic mine production, even with a 10 per cent increase in the present working force, indicates a further decrease of more than 11 per cent below 1944.

✦ ✦ ✦

THIS means that domestic production will be at the rate of 234,000 tons per quarter while imports will increase to 260,000 tons per quarter. According to present estimates, this schedule will bring production and requirements into balance for the year.

✦ ✦ ✦

DEMANDS for military and essential civilian needs declined appreciably during the first half of 1944 so that production was more than sufficient to cover them. However, increased Army requirements for ammunition for 1945 bring the total demand now to a higher level than the 1944 peak rate.

✦ ✦ ✦

### Tin

IF the war continues on a two-front basis during 1945, consumption of tin in the United States will remain virtually the same as it did in 1944.

SHOULD Germany be defeated in 1945, however, America's consumption of tin may drop as much as five per cent. However, it is expected that requirements of liberated European countries will increase the drain on America's supply of tin.

✦ ✦ ✦

CURRENTLY the government stockpile of pig tin represents about nine months' consumption at current rates. However, at no time since the outbreak of the war have our new supplies of tin been equal to requirements, and as a result there has been a continued drain on stocks.

✦ ✦ ✦

## Lead

WITH military requirements soaring monthly and with exports to our Allies increasing, the lead situation will become more severely critical in 1945, and the lead situation next year will be very much worse than it was in 1944.

✦ ✦ ✦

THE biggest consumers of lead are manufacturers of storage batteries. Lead is also extensively used in the manufacture of cable covering, pigments, ammunition and in the production of tetraethyl which is used in making high octane gasoline.

✦ ✦ ✦

IT was explained that the critical lead situation is attributable mostly to labor shortages. Smelting and refining capacity is adequate but the number of workers has been insufficient to raise production to meet requirements. Many workers have been drafted into military service while others have been attracted to higher-paying jobs in shipyards and aircraft factories.

✦ ✦ ✦

## Copper Plating On Aluminum

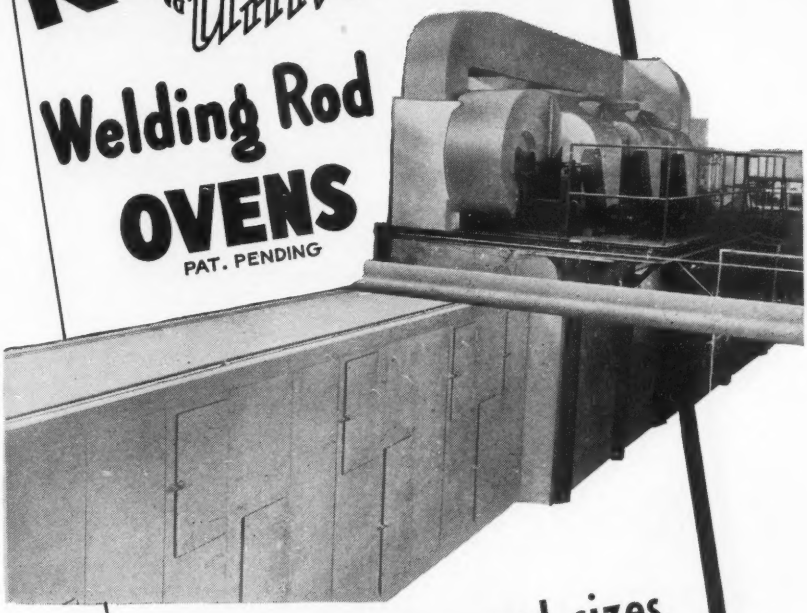
ADHERENT, uniform copper plating is now possible on aluminum and its alloys by means of a simple preparatory dip at room temperature.

✦ ✦ ✦

THE dipping solution may be used in a steel, wood or ceramic container. There are no fumes and venting is not required. This solution has a long life, is stable and not sensitive to drag-out, normal contamination or dilution.

*(Please turn to page 140)*


ROSS "Universal" Welding Rod OVENS
PAT. PENDING



Handle all types and sizes.
Controlled zones of heat and circulation.
Rods carried from pass to pass without jamming or marking.

Built in multipass and single pass continuous types, these modern ROSS "Universal" Ovens can be installed to process from 200 to 1200 rods per minute. Maximum flexibility of operation for handling any type of coated rod. Uniform control of air temperature, circulation and humidity throughout heating zones assures speedy production of hard, firm, dry coated rods, regardless of type.

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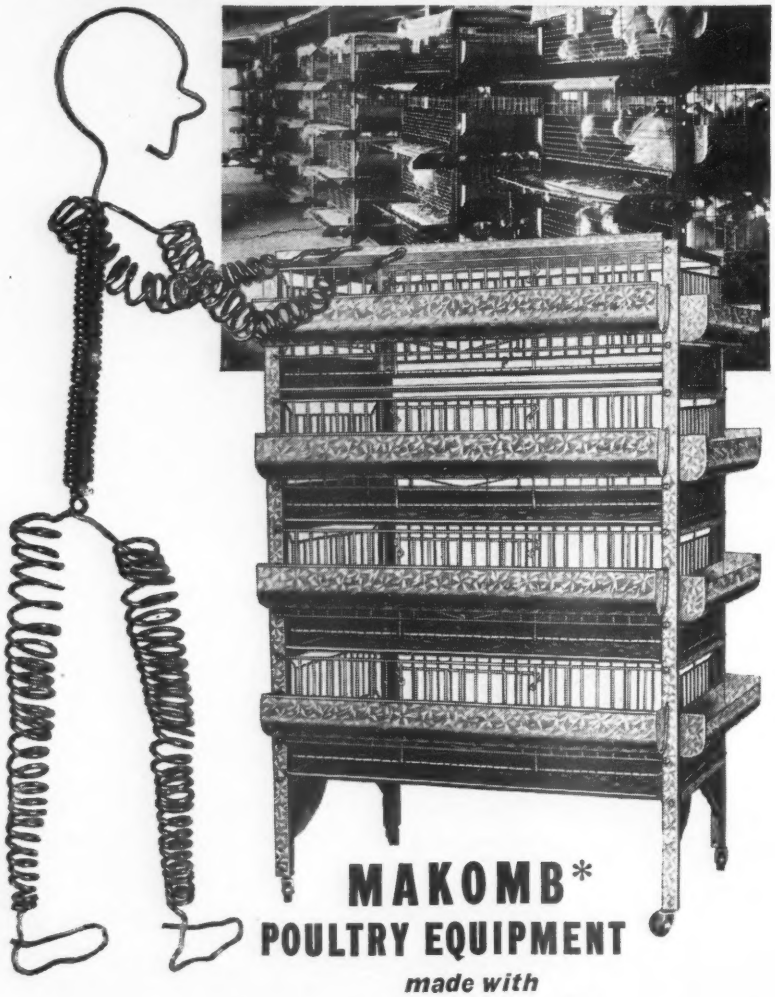
# Helping Produce Vital Food for Our Soldiers and Civilians



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*made with*

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Last year, farmers marketed over 2 BILLION POUNDS of vitally needed poultry meat . . . enough to provide *250 meals* for our entire armed forces. This year, even *more* poultry meat must be raised to meet requirements. Makomb Poultry Equipment is helping accomplish this food production miracle. Just as our fighting men need good equipment, and lots of it, our food producers must be well equipped, too.

Naturally, we are proud that Makomb, one of the leading manufacturers of poultry equipment, uses Keystone Wire.

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**KEYSTONE STEEL & WIRE CO., Peoria 7, Illinois**

Special Analysis Wire for All Industrial Uses

SAMSON SPRING WIRE

Coppered, Tinned, Annealed, Galvanized


## Government Wire Production Information

*(Continued from page 139)*

PRACTICALLY any copper electrolyte can be used as the plating solution except the sulfate types or those having a high degree of acidity. High-speed, bright-copper can be deposited with ease.

✦ ✦ ✦

COPPER plating on aluminum brings greater utility to this light metal. Since aluminum is difficult to solder, a flash coat of copper eliminates this difficulty.

✦ ✦ ✦

ALUMINUM also has a strong tendency to develop an insulating oxide coat, by mere air exposure. While aluminum itself is a good electrical conductor, this oxide coat growth on its surfaces reduces this conductivity considerably. When aluminum is copper plated this difficulty is overcome and this light metal becomes useful for electrical contacts and high frequency conductance.

✦ ✦ ✦

COPPER plated aluminum serves as a base for further plating, such as nickel, cadmium, chromium, zinc, etc.

✦ ✦ ✦

WHEN aluminum is copper plated and polished, it eliminates the usual dull aluminum finish which is so objectionable, as on pots and pans.

✦ ✦ ✦

ALSO copper plated aluminum can be used to build up worn surfaces, oversized diameters, etc. Of course other harder metals such as nickel or chromium may be deposited over the aluminum for greater hardness.

✦ ✦ ✦

SINCE copper can be colored by various means well known in the art, copper plated aluminum can therefore be finished in many light-fast colors for decorative and identifying purposes.

✦ ✦ ✦

THE process consists of a specified means of aluminum cleaning and preparation, followed by a 10 to 30 second immersion in a simple dipping solution at room temperature and then plating from the known copper plating electrolytes. It has been developed by the **Technical Processes Division, of Colonial Alloys Company.**

# A Review of Recent Wire Patents

No. 2,364,169, AUTOMATIC SCREW MACHINE, patented December 5, 1944 by Frederick G. Silva and Wray S. Seymour, Rochester, N. Y., assignors to Davenport Machine Tool Co., Inc., Rochester, N. Y., a corporation of New York.

✦ ✦ ✦

Associated with the machine frame and work spindle are a pair of Tool cross slides movable on opposite sides of this frame, toward and from the spindle, a lever pivoted on the frame and connected with each slide, operating cam means for each slide, a pair of toggle links pivotally connected with the cam means and lever, and having a pivotal knee connection with each other, and means for operating the cam means and pairs of toggle levers for actuating the slides.

✦ ✦ ✦

No. 2,364,561, COVERED CORE, patented December 5, 1944 by Clyde N. Stover, Towson, Md., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

✦ ✦ ✦

The wire conductor has a knitted fabric covering in which the courses and wales spiral around the conductor in opposite hands.

**Complete Descriptions and Drawings of Patents May Be Had for 25 cents; outside United States and Canada, $1.00. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.**

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No. 2,364,752, APPARATUS FOR TREATING STRANDS, patented December 12, 1944 by Vincent A. Rayburn, Baltimore, Md., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

✦ ✦ ✦

A conical curtain of a moisture dissipating gas is directed toward and about the wire strand in a direction opposite to that of the strand's movement. The arrangement is such that a thin curtain of the gas is projected against a small portion of the strand surface.

✦ ✦ ✦

No. 2,364,808, STRAND HANDLING APPARATUS, patented December 12, 1944 by Oscar G. Nelson, Baltimore, Md., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

Rotation of wire supply reels are governed by rotatable discs, the rotation of which are retarded by electro-magnetic means.

✦ ✦ ✦

No. 2,364,948, SPRING ASSEMBLY FOR BACK CUSHIONS, patented December 12, 1944 by William A. Clark, Detroit, Mich., assignor to L. A. Young Spring & Wire Corporation, Detroit, Mich.

✦ ✦ ✦

The uppermost row of helical springs has elongated coils at their tops to extend upwardly and be secured to a covered wire border frame, which latter is also secured to the intermediate coils of some of the end springs. There is also a supplementary bottom border member also secured to certain of the coils.

✦ ✦ ✦

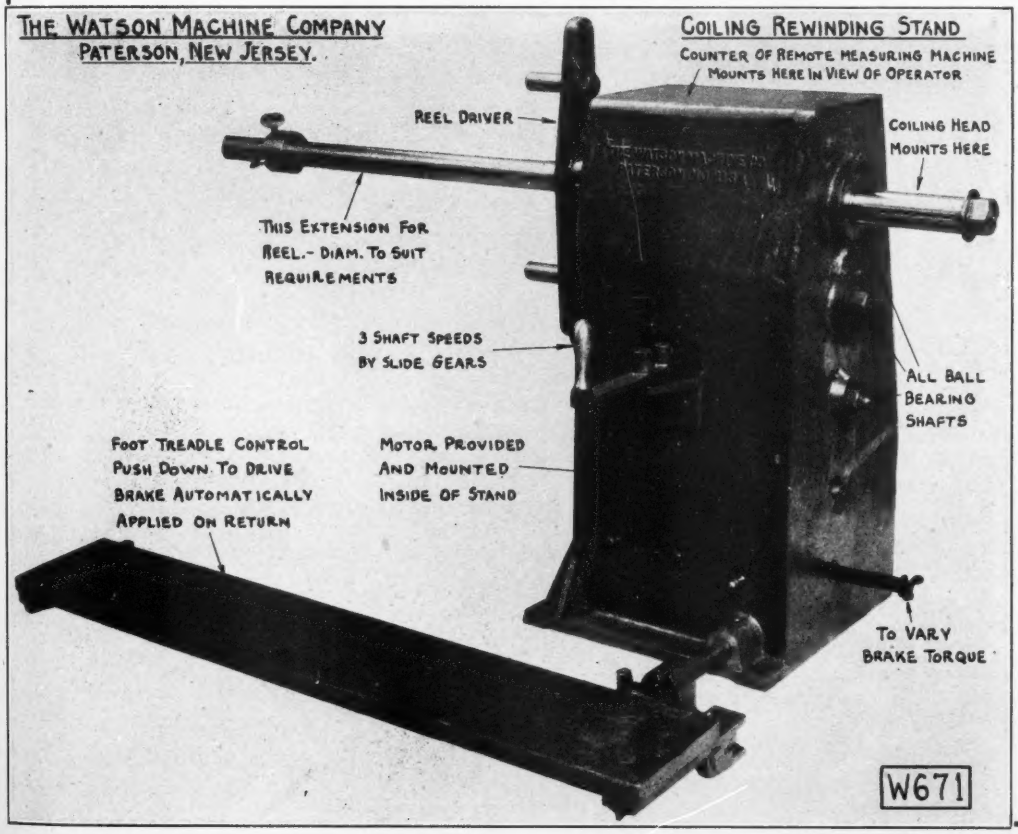
No. 2,364,966, SPRING FOR BEDS AND MATTRESSES, patented December 12, 1944 by Benjamin Gladstone, Lynn, Mass.

✦ ✦ ✦

The end convolutions of the coil springs are connected in longitudinal rows, and the smaller, intermediate portions of the

*(Please turn to page 142)*


THE WATSON MACHINE COMPANY
PATERSON, NEW JERSEY, U.S.A.


THE WATSON MACHINE COMPANY
PATERSON, NEW JERSEY.
COILING REWINDING STAND
COUNTER OF REMOTE MEASURING MACHINE MOUNTS HERE IN VIEW OF OPERATOR
REEL DRIVER
COILING HEAD MOUNTS HERE
THIS EXTENSION FOR REEL.- DIAM. TO SUIT REQUIREMENTS
3 SHAFT SPEEDS BY SLIDE GEARS
ALL BALL BEARING SHAFTS
FOOT TREADLE CONTROL PUSH DOWN TO DRIVE BRAKE AUTOMATICALLY APPLIED ON RETURN
MOTOR PROVIDED AND MOUNTED INSIDE OF STAND
TO VARY BRAKE TORQUE
W671

THESE UNITS ARE WIDELY EMPLOYED IN WAREHOUSES AND SHIPPING ROOMS AND COMBINE REELING AND COILING IN A MINIMUMOFSPACE.

* * *

HEAT TREATED ALLOY SHAFT OF LENGTH TO SUIT AND DIAMETER TO 2⅜", 28" FROM FLOOR.

* * *

1 H.P. MOTOR

* * *

SPEED RANGES:
31 - 54 - 108
or
45 - 98 - 137
R.P.M.

* * *

LITERATURE ON REQUEST.

## Review of Recent Wire Patents

*(Continued from page 141)*

springs are connected in transverse rows and in diagonal rows, so that the smaller convolutions act as a unit to take strains which affect any one of them.

✦ ✦ ✦

No. 2,365,019, INSULATED ELECTRICAL CONDUCTOR, patented December 12, 1944 by Howard J. Stewart, York, Pa., assignor to General Electric Company, a corporation of New York.

✦ ✦ ✦

About the wire conductor is an insulating wall of glass fibres, coated and impregnated with heat-set soya bean oil, there being a glass braid over the wall and a baked heat-stable synthetic resin coating on the braid.

✦ ✦ ✦

No. 2,365,083, GOLD-FILLED WIRE, patented December 12, 1944 by Tracy C. Jarrett, Southbridge, Mass., assignor to American Optical Company, Southbridge, Mass., a voluntary association of Massachusetts.

✦ ✦ ✦

Specifically, the wire has a core of metallic particles of a relatively inexpensive base metal alloy selected from a group of metals consisting of nickel, copper, cobalt, and beryllium-copper with at least a portion of the particles having a lower melting point than the solid precious metal, these particles being in compressed and sintered relation with each other and in sintered relation with th einner surface of the precious metal shell.

✦ ✦ ✦

No. 2,365,959, STAINLESS STEEL WIRE, patented December 26, 1944 by Charles Richard Horwedel, Lakewood, Ohio, assignor to The American Steel and Wire Company of New Jersey, a corporation of New Jersey.

✦ ✦ ✦

A compressed film consisting solely of wax of the class consisting of beeswax, Chinese wax, paraffin, bayberry wax and carnauba wax having melting temperatures exceeding 40°C., this film being dieworked into the surface of the wire under pressure so extremely high that the wire is reduced in size by the die-working, the film being substantially invisible while being detectable by the wire having a waxy feel giving it antifriction properties.

✦ ✦ ✦

No. 2,366,062, MACHINE FOR OPENING OR LAPPING WIRE DRAWING DIES AND THE LIKE, patented December 26, 1944 by Donald F. Sengenberger, Waukegan, Ill., assignor to The American Steel and Wire Company of New Jersey, a corporation of New Jersey.

✦ ✦ ✦

There are 12 claims in this patent for a machine adapted to hold a number of workpieces and revolvable tool holders, one positioned opposite the position each workpiece will assume. Each holder is adapted to support a tool for forming a hole in its workpiece, the tools being reciprocated relative to their respective workpieces.

✦ ✦ ✦

No. 2,366,065, ANNEALING PLATFORM, patented December 26, 1944 by Oke S. Sieurin, Shrewsbury, Mass., assignor to The American Steel and Wire Company of New Jersey, a corporation of New Jersey.

✦ ✦ ✦

This platform for coils of wire comprises a support base, a central support adapted to carry a number of piles of coils about its periphery, a rim for the base and a raised rest on the base adjacent this rim for supporting each of the piles with their bottoms sloping downwardly toward the support.

✦ ✦ ✦

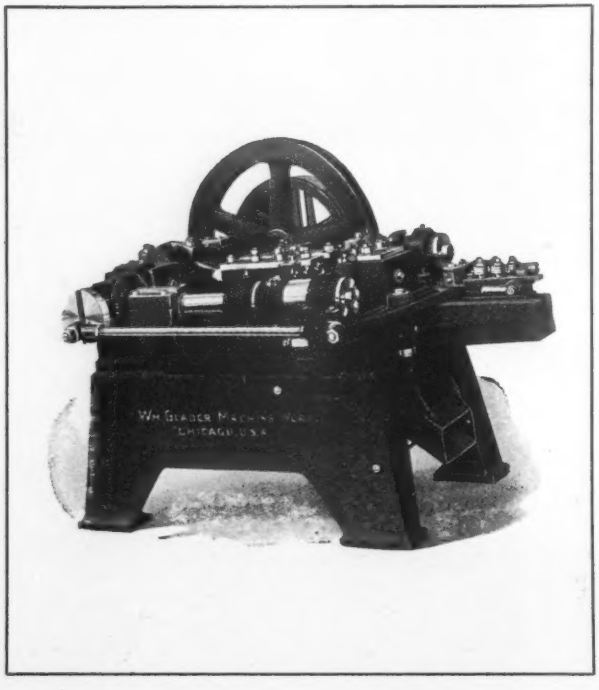
## Industrial Diamonds

AN adequate supply of industrial diamonds is assured for essential American uses during the first half of 1945 through an accord reached with the British Ministry of Supply, WPB reported recently.

✦ ✦ ✦

IT was stated that the supply of industrial diamonds available during the first six months of 1945 for American use would be in amounts comparable to the 1944 rate.


# GLADER HIGH SPEED WIRE NAIL MACHINE



High tonnage output, and low maintenance costs, have resulted in Glader Machines being accepted as standard equipment in every large nail mill built in the United States in the past twenty years.

Glader Machines are operating in most of the wire producing mills throughout the world.

These machines are made in eleven different types and sizes. This enables us to cover the range of sizes of nails produced with the greatest efficiency.

For further information please address,

**WM. GLADER MACHINE WORKS**

210 NO. RACINE AVE.

CHICAGO, ILLINOIS

## Tactical Field Wire

TACTICAL field wire requirements have increased much more rapidly than it has been possible to expand facilities. Despite steadily rising production, requisitions from active theaters have been so far out of line with production possibilities that critical types of wire are now on a ration basis; each theater commander has been notified of the amount he can be furnished. As a result, the Army Signal Corps has found it necessary to set up a feasible requirement based on estimated production possibilities. The chart, "Far Short of Demand," indicates that program, the recent sharp gains, and computed requirements.

✦ ✦ ✦

THREE types of wire are critical:

1. Assault wire (W-130). Assault troops carry a half mile of this wire on a small reel strapped to their backs. The lightness of the reel and wire make it possible for a man to crawl to an advanced position where he can observe the enemy, report back to headquarters on his attached field telephone, and sometimes direct artillery fire. W-130 is made of size .0095 steel and copper wire stranded and insulated. Stranding facilities have been the major limiting factor. Additional stranding facilities have been added, and further relief could be obtained if all stranders operated around the clock.

✦ ✦ ✦

2. Field wire (W-110B and WS-1/TS), a heavier product than assault wire, is the most widely used of all tactical wires. In addition to being stranded and insulated, it is cotton covered and weatherproofed. The chief production limitation is the supply of galvanized carbon-steel wire. Facilities for making this fine (.013) wire are limited. More could be supplied, but it would be at the expense of other programs, particularly stranded steel wire rope and aircraft cable. In accordance with the urgency of the various programs, 1,709 tons of this wire monthly has been set aside for the Signal Corps program, but this is not sufficient to meet computed objectives.

✦ ✦ ✦

3. Long-range communication wire (W-143), a much heavier, all copper wire is designed for a talking distance five times that of W-110. The problem here is that requirements have quadrupled since the first of the year and facilities to meet the new program have not been able to catch up. A former ordnance plant at Lowell, Mass., is being converted to the manufacture of this wire and is expected to carry the load at capacity operation. However, this mill has been slow in getting into production. The overall problem in this particular wire is training of labor.

✦ ✦ ✦

THE lack of rubber has made insulation a problem for all three types of critical wire. Various compounds of synthetic rubber have been tried and some replaced as improved processes were developed. At the present time, Buna S is proving the most satisfactory for W-110B and W-143, but the mixing operation requires a longer time than formerly needed for crude rubber. Facilities have been enlarged to compensate for the longer milling time. Two types of plastic (polyethylene and polyvinyl chloride) insulation are also being used on W-130. The main job now is to insure that facilities operate at capacity and to correct some minor labor shortages.

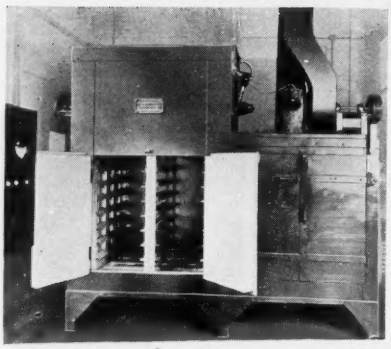
Take a Tip From
MEN WHO HAVE TRIED!
Here's something to consider next time you need wire spools and reels for such operations as drawing, annealing, or shipping. Take a tip from the men who have tried, and judge these engineered Hubbard spools and reels by modern purchasing standards. When you add up construction features, balance, long life and price, you'll find Hubbard products give you more for your money.
These facts can be your guide to better values in spools and reels for every wire mill use. Just write us today about your needs—we'll do the rest.
ARMY E NAVY
HUBBARD SPOOL COMPANY
1624 CARROLL AVENUE | CHICAGO 12, ILLINOIS
Since 1912, manufacturers of wire drawing and annealing, and shipping spools and reels.
PLANTS AT CHICAGO, ILLINOIS AND GARRETT, INDIANA

## Develops New Box-Type Oven for Volatile Solvents

THE Industrial Oven Engineering Company, 11621 Detroit Avenue, Cleveland, has developed a standard box-type oven for the high-speed evaporation and drying of highly volatile solvents. It is a self-contained unit, with all heating equipment and ductwork built into the oven shell, and is shipped either assembled ready to operate, or in pre-fabricated sections for assembly.

✦ ✦ ✦

DOOR sizes range from 3 feet wide by 3 feet high to 5 feet wide by 6 feet high, and working depth from 3 to 6 feet. The temperature range is from 150° to 900° F., with a tolerance of ±2°. Despite the fact that the oven is direct gas fired, it has been proved to be perfectly safe and has insurance company approval.



New Box Type Oven.

✦ ✦ ✦

THE oven illustrated is a standard size (4-foot by 5-foot door and 4-foot depth) with a preheating zone added, the latter heated by exhaust air from the oven proper. It is used to dry fabricated paper parts which have been dipped in a finishing solution consisting of approximately 50 percent alcohol and 50 percent solid matter. On this job it has reduced drying time from 25 minutes to 5 minutes, cut drying costs substantially, increased hardness of the finish, and relieved brittleness, previously a characteristic of the finish.

✦ ✦ ✦

THESE ovens can be used for alcohol, acetone, naphthas, methyl-ethyl-ketone and many other highly volatile solvents, and can be converted without delay for other types of drying, finishing, heat treating or heat processing where materials can be handled in trays, jigs or baskets. It is especially suited to dense loads where air stream resistance is high. Completely automatic controls, of the expansion recording thermometer type or the millivoltmeter type, either air or electrically operated, are supplied to suit the user.

✦ ✦ ✦

## Reprints of Paper on Fine Wire Available

THE North American Philips Co., Inc., 100 East 42nd St., New York, N. Y., has made available reprints of the technical paper given by **H. P. Edinga,** Wire Division Manager, at the Wire Association Convention in October, entitled "Some Problems Influencing the Drawing of Fine Wire." Machines, labor, lubrication, diamond dies and production output are some of the items discussed. Copies may be had upon request.

TECO Cemented Carbide reduces time and production losses caused by too-frequent die changing. Correct size and finish are held for longer runs, producing greater tonnage per day, per die, per machine.

TECO Cemented Carbide has greater resistance to wear and friction because—made to rigid standards—it is harder, denser, more uniform. Let a test run prove that it's profitable to put these smooth-wearing, slow-wearing dies on the "business end" of your machines. Our engineers are glad to discuss your requirements.

WIRE and BAR DIES
SIZING DIES—EXTRUDING DIES
TUBING DIES
Carbide Blanks, Tools, Bits,
Reamers, Broaches, Forming Tools

TUNGSTEN ELECTRIC CORPORATION — 564 39th St., Union City, N. J.
Branch Office: 2906 Euclid Avenue, Cleveland, Ohio
Representatives: Indianapolis, Chicago, Detroit

TECO Pioneers in Tungsten Carbides for over a Quarter Century CARBIDE DIES

## "Jobs for G. I. Joe"

THE above is the title of a very complete analysis made by the **American Hotels Association,** 221 West 57th Street, New York 19, N. Y., in an effort to assist their members in their plans to absorb returning war veterans, both able and disabled, on an intelligent basis.

✦ ✦ ✦

WE mention this booklet because it may well serve as a guide to large industrial concerns in helping them to analyze the problem of putting veterans back to work.

✦ ✦ ✦

## Wire and Cable Insulation Progress As Reported by G.E. in Its Year-End Summary: "Electrical Developments of 1944"

FLAMENOL, a thermoplastic synthetic insulating material, played an important role in the year's developments in insulated wire and cable. Railway signal cable employing such insulation was produced without fibrous protective coverings, for both aerial and direct-burial applications. It was because of notable improvements in the moisture resistance and the electrical properties of the dielectric that the new design proved acceptable for such specialized and important service. Over-all dimensions and weights of the signal cable were reduced by elimination of several conventional parts in the simplified design.

✦ ✦ ✦

FLAMENOL insulation was also applied most successfully to small diameter wire for use in wet locations.

✦ ✦ ✦

A variety of permanent colors not previously available in rubber compounds was achieved with the application of Flamenol insulation to new all-synthetic flexible cords for light, medium and heavy duty use on appliances, tools, and portable equipments.

✦ ✦ ✦

THE use of materials and technique previously unknown to the cable industry was required in the development for the electronic industry of low-loss coaxial cables featuring solid dielectric and flexibility.

## Booklet Describes X-Ray Machine For Identifying Materials

A new 4-page leaflet describing "X-Ray Diffraction—An Industrial Tool," has been announced by **North American Philips Company, Inc.,** 100 East 42nd Street, New York.

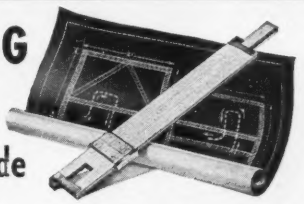
✦ ✦ ✦

IT explains the technique employed in NORELCO film-type X-ray equipment for identification of materials. Simple sketches representing typical diffraction films are exhibited in order to show how comparisons are made.

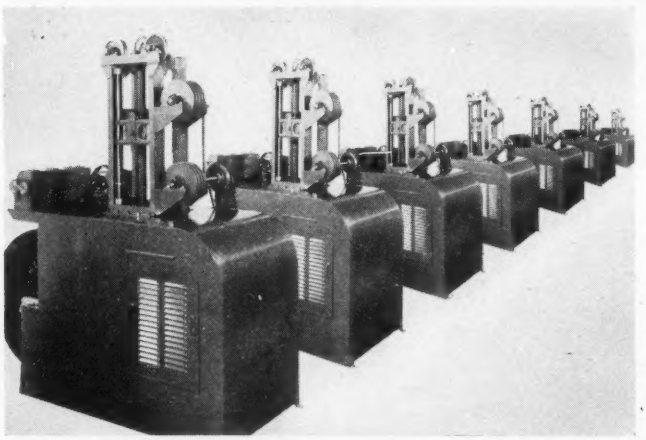
✦ ✦ ✦

AMONG other industrial applications for X-ray diffraction, the equipment may be used for identification of aluminum oxide modifications; differentiation of inorganic fibers; metallic deposition in formation of metallic carbides, and determination of character of metallic films.


# OVEN ENGINEERING NEWS



## IOE Windup Machine Now Made In Quantity Lots for Many Problems of Wire Manufacture



• Originally developed as special equipment to speed the production of more uniform cable insulation finishes, the **IOE** constant-speed constant-tension windup machine has since provided a solution for a number of other manufacturing problems. It is now used for saturating take-up, respooling, continuous spark testing take-up, single-reel extrusion take-up, and tubing, waxing and enameling take-up.

These machines are still made to individual order, but all parts are standardized, and the units are being built in quantity. Two standard sizes are now available. These are:

No. 1—26″ - 36″ reel diameter
No. 2—12″ - 24″ reel diameter

The **IOE** windup machine is a complete, self-contained unit with combination variable speed and hydraulic synchronizing equipment, designed to provide constant speed and constant tension within a variable production range. By arrangement of adjustable tension devices, tension on the material can be varied from a few ounces to hundreds of pounds. The machine is motor driven, requires no outside source of power or synchronization, and can be used in conjunction with either driven or friction unwind machinery. It is supplied in higher speeds for extrusion windup of rubber and synthetic insulation materials.

### GET MORE DATA

• "Blueprint for Industry — Part III" describes the **IOE** windup machine in detail. Send for your copy.

(This is No. 13 of a series. Reprints of previous advertisements will be sent free upon request.)

**THE INDUSTRIAL *Oven Engineering* COMPANY**

Cleveland 2, Ohio — 11621 Detroit Avenue

# Outstanding Personalities of the Wire Industry

GEORGE S. WHYTE, 77, chairman of the board of the Macwhyte Company and widely known civic leader and philanthropist, died suddenly on December 16th.

✦ ✦ ✦

THE saga of the rise of George S. Whyte from the humble foundation of a coal miner in Scotland for a wage of a few pennies a day to the position of industrial magnate, civic leader and philanthropist, is one of the most amazing success stories to be written.

✦ ✦ ✦

BORN in Crossgates, Scotland, on March 20, 1867, the son of Mr. and Mrs. George S. Whyte, Sr., he came from hardy Scotch stock. He came to America in the 1880's and in 1936 he became part of the Leschen Macomber Whyte Rope Company. A factory building was erected at

GEORGE S. WHYTE

Coal City, Ill., in 1901, and the business thrived. The company moved to Kenosha in 1912 and the first piece of wire rope made in the new Macomber and Whyte Rope Company plant in Kenosha was produced Sept. 8, 1912, now the Macwhyte Company.

✦ ✦ ✦

FROM that time on the story of George S. Whyte is a story which breathes inspiration through hard work, indefatigable energy, and a genius for leadership that attracted to his side faithful and loyal workers who thrived with him.

✦ ✦ ✦

GEORGE Whyte started a profit-sharing system whereby his fellow workers shared in the business with bonus payments.

✦ ✦ ✦

FROM an annual payroll of $100,000 in 1912, the company has grown to one of the leading firms in its field. It holds the Army-Navy "E" and has earned every commendation within the gift of a grateful government for its outstanding war production.

WAR calls for a lot of WIRE
WIRE • SCREEN WIRE CLOTH
POULTRY NETTING • NAILS
● From the fighting front, all the way back to the production line, wire has innumerable war jobs to do—tough tasks that show up just how good modern wire can be made. Cortland Wire is in service on many fighting and production fronts, performing essential tasks that generally are unseen and unsung.
Whether it is for armor wire, wire cloth for airplane air filters, aircraft engine casting pins, or wire for the common nail, performance is the real measure of wire value. And on the basis of performance, Cortland Wire has been exceeding the strictest specifications—the result of Cortland's more than 70 year experience in making America's finest wire and wire products.
WICKWIRE BROTHERS, INC.
CORTLAND, NEW YORK
Cortland Brands
WICKWIRE IS WARWIRE
Life at sea does things to electric cable—and finely-drawn, tough, corrosion-resistant steel wire, woven in a special basket-weave pattern, protects cable, giving it strength and flexibility to "take it."
Supplying this wire is another duration job assigned to Wickwire Brothers, Inc., because of a peacetime reputation for making highest-quality wire.

## Wickwire Spencer Appoints Allington Assistant General Sales Manager

THE **Wickwire Spencer Steel Company** has announced the appointment of **H. C. Allington** as Assistant General Sales Manager of the **Wickwire Spencer Company** and its subsidiary the **American Wire Fabrics Corporation.**

✦ ✦ ✦

MR. **Allington** became associated with **Wickwire Spencer** in February, 1944 as Sales Research Engineer in charge of the development and expansion of markets for the Company's products. Prior to joining Wickwire Spencer, Mr. Allington was with the **Logan-Allington Company, Inc.,** and the American Machine and Metals, Inc.

✦ ✦ ✦

IN his new position, **Mr. Allington** will continue his work on market development and expansion. He will also supervise the activities of the Company's various sales divisions and develop policies in line with **Wickwire Spencer's** currently expanded operations. He will be located at the Company's executives offices, 500 Fifth Avenue, New York 18, N.Y.

✦ ✦ ✦

## D. C. Prince Heads G-E General Engineering

DAVID C. PRINCE, vice president of **General Electric** will take charge of the company's General Engineering Laboratory, the activities of which will be broadened to include the requirements of the entire company, it has been announced by President **Charles E. Wilson.** This change from the responsibilities of application engineering for the Apparatus Department will become effective January 1. Mr. Prince has also been chairman of the company's special planning committee.

✦ ✦ ✦

A graduate of the University of Illinois in 1912, Mr. Prince's service with G.E. has been continuous except for five years beginning in 1914 which he spent with the Illinois Public Utilities Commission and as an officer in World War I. He was for several years associated with **Dr. E. F. W. Alexanderson,** world famous radio pioneer, was a member of the research laboratory staff and subsequently became research engineer on switchgears and manager of commercial engineering. Mr. Prince is a past president of American Institute of Electrical Engineers.

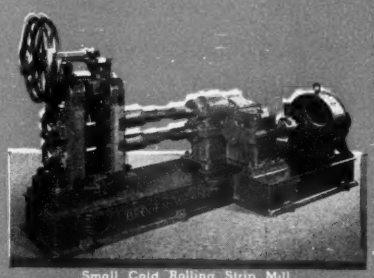
✦ ✦ ✦

## Pittsburgh Steel Adds To Stainless Staff

PAUL C. SANDMEYER has joined the Stainless Steel Products sales department of **Pittsburgh Steel Company,** Pittsburgh, Pa. He comes from Jessop Steel Company, Washington, Pa., where he was manager of The Stainless Steel Division. Previously he was with Carnegie-Illinois Steel Company for 15 years, serving in various capacities in the Stainless Steel Division.

*(Please turn to page 148)*


WEAN-BRODEN



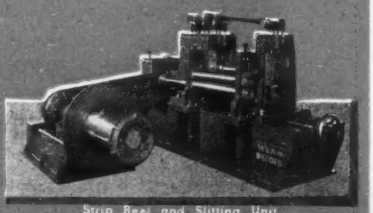
Small Cold Rolling Strip Mill

THE Wean Engineering Company, Inc., have long been recognized as specialists in sheet, strip and tin mill equipment . . . The Broden Construction Company specializes in the manufacture of narrow strip and wire mill equipment.

With the extended facilities of The Broden Construction Company as a subsidiary of The Wean Engineering Company, Inc., it is now possible to serve the steel industry more effectively.

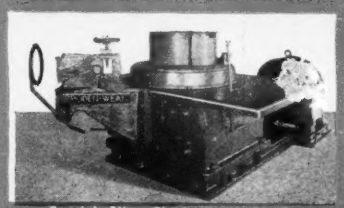
COLD ROLLING MACHINERY
For 36" Wide Material and Narrower
Mills • Reels • Slitters • Levelers • Coilers
Edgers • Scale Breakers • Shears
Scrap Ballers • Continuous Pickling

WIRE MILL EQUIPMENT
Wire Drawing Machines • Patenting
Galvanizing and Tinning Take-Up Frames
Wire Flattening • Spoolers • Nail
Galvanizing and Blueing

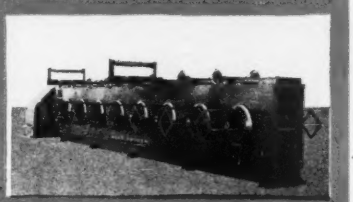


Strip Reel and Slitting Unit

HOLMQUIST BARBED WIRE and WIRE FENCE MACHINERY



Special Alloy Single Draft Heavy Duty Vertical Wire Drawing Block for ⅛" Round Wire



The BRODEN CONSTRUCTION Co., Inc., Cleveland, O.
A SUBSIDIARY COMPANY OF
The WEAN ENGINEERING Co., Inc., Warren, O.

## Outstanding Personalities of the Wire Industry

*(Continued from page 147)*

### J. E. Smith Joins Wickwire Spencer Metallurgical

THE **Wickwire Spencer Metallurgical Corporation,** subsidiary of the Wickwire Spencer Steel Company, announces that **J. E. Smith** has joined the organization as foreman of Fabricated Parts Department.

THE Corporation manufactures fine drawn molybdenum and tungsten wires and tungsten carbides and dies, and is planning greatly increased production to meet heavy demands for its products.

✦ ✦ ✦

MR. Smith was formerly with the **Western Electric Company** at the Kearny Works as foreman of Inspection and Maufacturing Departments. Previously he had been with the **Peoria Power and Light Company** and **the Carter Machine and Electrical Manufacturing Co.** He will be located at the plant at 260 Sherman Avenue, Newark 5, New Jersey.

✦ ✦ ✦

### Appoints Distributors for New York Metropolitan Area

BRICKER and ANDES, 316 Atlantic Ave., Brooklyn, N. Y., have been appointed Agents and Distributors of the Inhibitors and Metal Working Chemicals for the **American Chemical Paint Co.** of Ambler, Pa.

✦ ✦ ✦

THE territory covered by **Bricker & Andes** consists of the following counties in New York State—Manhattan, Kings, Queens, Richmond, Bronx, Nassau, Suffolk, Westchester and Rockland. In New Jersey: Hudson, Essex and Union.

✦ ✦ ✦

THE experience of the Technical Service Staff of **Bricker and Andes** will supplement the cooperation of the **American Chemical Paint Company**'s Technical Staff and Laboratories in the solution of chemical metal working problems.

✦ ✦ ✦

### Steel Committee for Western Steel Industry

FORMATION of a "Steel Committee" of the Los Angeles Chamber of Commerce to reexamine the western steel industry with a view to determining how the supply of steel can be increased and the cost reduced, was announced yesterday by **George J. O'Brien,** chairman of the chamber's industrial development committee.

✦ ✦ ✦

ONE of the first moves of the steel committee, which is headed by **Alden Roach,** president of **Consolidated Steel Corp.,** Los Angeles, will be to attend the steel conference of the newly formed Western States Council in Salt Lake City Feb. 12-13.

✦ ✦ ✦

ALREADY the new Los Angeles committee has held one meeting at which it was decided:


# JOIN THE . . . . WIRE ASSOCIATION

**To those wire mill men who have not already joined the Wire Association for the mutual benefit of those engaged in the operating end of the Wire Industry, a cordial invitation is extended to become a member.**

**If you are making rods and wire—of steel, copper, brass, alloy or any ferrous or non-ferrous metal, or are in the wire products end—nails, bolts, screws, rivets, wire rope, wire cloth, springs, electric wire and cable or any of the numerous products made of wire, you will benefit by identifying yourself with the Association.**

***The Wire Association is a non-profit organization of wire and wire products mill superintendents, executives and foremen, whose specific purpose is to improve production methods and afford a clearing house for ideas on management, technical and research problems, and to develop and maintain friendly relations among members.***

**Dues are only $10.00 a year. This includes:**

**WIRE AND WIRE PRODUCTS—for one Year.**
The official publication of the Wire Association, covering the industry's metallurgy, technology, research, processes, machinery and personnel.

**THE ANNUAL BUYERS GUIDE & YEAR BOOK OF THE WIRE ASSOCIATION—**
The Year Book Section contains: Constitution and By-Laws of The Wire Association; details of year's meetings, etc.; list of members, index to papers and articles in WIRE AND WIRE PRODUCTS.

**QUESTION AND ANSWER SERVICE—**
Answers to technical and operating problems direct by mail. Available to members only.

**ANNUAL CONVENTION AND REGIONAL MEETINGS—**
Including technical sessions and discussions, local plant inspection, and opportunities to make personal contacts with other members of the industry, for the interchange of helpful information. Write today for a membership application card.

**INFORMATION SERVICE ON MACHINERY, EQUIPMENT AND SUPPLIES—**
The Technical, Catalogue and Correspondence Files of the Wire Association hold the answer to practically every "Where can I buy" problem. This service available to members without charge.

***Write today for a membership application card***

**THE WIRE ASSOCIATION**

RICHARD E. BROWN, Executive Secretary

300 MAIN STREET STAMFORD, CONN.

1. To undertake a survey which will indicate whether the new steel mills at Fontana, California, and Geneva, Utah, can be depended upon to operate in the postwar period under private ownership.
2. To determine what changes in these facilities will be necessary to enable them to supply peacetime requirements of western steel fabricating plants.
3. To ascertain what other steps will be required to furnish lower priced steel for western steel fabricators and steel product manufacturers.

✦ ✦ ✦

ACTION also is expected to be taken in recommending to Congress a program for transfer of titles of Geneva and Fontana to a private ownership that will enable these two mills to operate in the West's peacetime economy.

✦ ✦ ✦

PERSONNEL of the newly formed Los Angeles group follows:

Alden Roach, chairman of the committee, president of Consolidated Steel Corp.; LeRoy M. Edwards, president of the Los Angeles Chamber and vice-president and general manager, Pacific Lighting Corp.; W. C. Mullendore, past-president of the Chamber and executive vice-president, Southern California Edison Co.; Leonard E. Read, general manager, Los Angeles Chamber; G. A. Axelson, chairman of the board, Axelson Manufacturing Co.

✦ ✦ ✦

John E. Barber, Consolidated Steel Corp.; C. E. Bradburn, president, Pacific Iron & Steel Co.; B. Bronzan, general manager, Baash-Ross Tool Co.; W. A. Buehler, general manager, Buehler Tank and Welding Works; E. S. Dulin, Byron Jackson Co.; William H. Guild, executive assistant, Union Pacific Railroad Co.; B. A. Hinckley, president, General Water Heater Corp.

✦ ✦ ✦

Kenneth T. Norris, Norris Stamping & Mfg. Co.; George J. O'Brien, vice-president, Standard Oil Co. of Calif.; D. P. O'Keefe, president, O'Keefe & Merritt Co.; Morris B. Pendleton, president, Plomb Tool Co.; John Rauen, U. S. Spring & Bumper Co.; Robert Miller, Southwestern Engineering Co.; Emercon Spear, Pacific Wire Rope Co.; Carlton B. Tibbetts, president, Los Angeles Steel Casting Co.; and James F. Bone, secretary of the committee, manager, industrial department, Los Angeles Chamber.

## New Detergents Company Formed

THE Optimus Detergents Company, now in operation at Matawan, N. J., manufactures industrial detergents and has developed some new cleaning methods for industrial use in its research laboratory and pilot plant.

✦ ✦ ✦

THE Optimus Detergents Company will also have available the facilities of its associate, Optimus Equipment Company, so that cleaning methods to be followed can, where needed, be utilized and developed with the aid of specialized cleaning equipment. Both companies are functioning in close affiliation with the **Hanson-Van Winkle-Munning Co.**, also of Matawan, N. J.

### AD THOUGHT

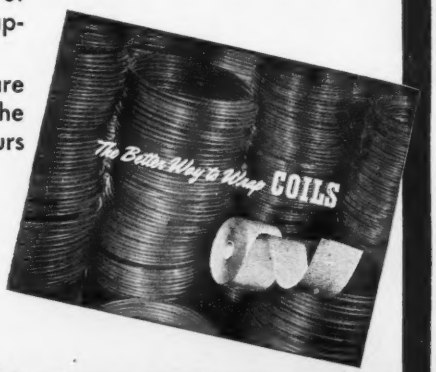
**ADVERTISING is a service to a magazine's readers. Methods, materials, machinery are developing under the stress of war. Both editorial matter and advertisements keep you informed on what is happening in industry. Answer ads when they interest you, and PLEASE mention WIRE & WIRE PRODUCTS.**


Angier
OF FRAMINGHAM
50Th. ANNIVERSARY
1895 – 1945

Resilient, spiral wrapping papers that S-T-R-E-T-C-H — originated by Angier of Framingham many years ago — were quickly recognized as the long-awaited solution to the problem of "How to provide tight-fitting, non-breaking, protective wraps for coils of wire, etc."

To supply a complete and trouble-free service to the users of these wraps, Angier Engineers developed practical wrapping machines built for long life — equipped with tension, edge-folding and coreless devices which cut down interruptions, eliminate cores and the wasting of paper, producing lower unit wrapping costs.

Angier Machines and Wrappers are illustrated in a new booklet, "The Better Way to Wrap Coils" — yours for the asking.




*When writing us, please mention by name this magazine.*

Angier
ANGIER CORPORATION
CORROSION PREVENTIVE AND WATERPROOF PAPERS
FRAMINGHAM, MASSACHUSETTS

## Employee Selection in the Metallurgical Industry

*(Continued from page 131)*

recorded in a sheet, such as shown on Table VII and from it a decision is reached as to the most suitable job for the man if his capabilities do not come up to the necessary ones for the job of his choice.

✦ ✦ ✦

AFTER the man has been assigned to the most suitable job and while he is on training, his suitability for the job has to be followed up. This follow up is a check on the prognosis made at the start. The follow up consists in filling a report sheet by the man's trainer or superior. In addition to showing whether the man fits the job selected for him, it permits evaluation of the development of the man. (Table VIII, see page 130).

✦ ✦ ✦

THE comments of the author on the talents of the German people versus job requirements are of interest. There appears to be an excess of practical-manual ability, but a deficiency in people with a theoretical-intellectual ability. The problem for Personnel directors and job trainers is to be economical with such talent. It will be necessary to assign young people to jobs with requirements for which they do not have altogether all the necessary abilities. The trainer will have to take care of the deficiencies as best as possible. The engineer interested in the further development of the technique will have to contend not only with the limitations of raw materials and technical difficulties, but also with the spiritual condition of the working people who shall design, build and serve the machines.

✦ ✦ ✦

## Shortage of Field Telephone and Telegraph Wire for Military Purposes

*(Continued from page 136)*

**2. Manpower assistance was provided by initiating action, in collaboration with War Production Board, which placed production of the above wires on the National Production Urgency list for labor referra s. Subsequently the list was revised which made the urgency applicable to only the steel wire and strand producers; however, recent action has been taken to restore the urgency rating to all plants fabricating steel wire, strand, or finished wire. The manpower goal, of course, is sufficient labor to provide twenty-four hour operation of all existing equipment wherever that equipment covers the bottleneck operation of the program.**

**3. Training wire needs are being filled by acceptance of wire considered substandard for combat use. In many instances use has been made of short lengths, accumulated by contractors during production, which were spliced together making a suitable training wire.**

**4. Used wire is being reclaimed and repaired to the maximum extent feasible.**

**5. Additional new facilities, particularly stranding and braiding, are being provided and expedited in collaboration with the War Production Board.**

**6. Best possible distribution of available raw materials to the finished wire manufacturers has been effected in collaboration with the War Production Board. Efficient distribution of the steel wire strand and cotton yarn components of the finished wires has been accomplished by directive action where necessary.**

✦ ✦ ✦

PRODUCTION of communication wire has reached an all-time high but the time when all demands will be met is not yet definitely in sight. The Signal Corps, Army Service Forces and the War Production Board are confident, however, that the wire industry will take up the challenge and that present Signal wire shortages will be of short duration.

Checking gold-clad molybdenum wire with chemically treated paper which electrically tests porosity of covering. Microphoto at left shows blistered condition frequently produced by ordinary plating methods. One at right shows smooth surface of North American Philips coating. Magnification 40X, center of wire only in focus.

GOLD-CLAD *Fine Wire*

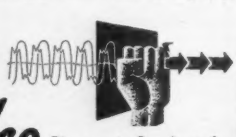
NORTH AMERICAN PHILIPS has pioneered two important developments in gold-clad fine wire. The first was the domestic production of gold-coated fine wire for military uniforms. Developed early in 1942, we were in production by October of that year.

Then, new electronic tube developments created a war-born demand for gold-coated molybdenum fine wire, which North American Philips also developed.

Today we are exclusive suppliers of gold-clad fine wire to many leading electronic tube manufacturers and makers of military insignia. On fine tungsten, molybdenum and silver wire, we can produce a smooth, even, non-blistered, non-porous gold coating with these features: It **sticks**, even when elongated. It **guards against undesirable grid emission** in electronic tubes. It can be **controlled to rigid customer specifications.**

These superior qualities are the result of highly specialized equipment and closely controlled processing techniques developed by an organization with a background of over 50 years experience in the electrical field. North American Philips manufactures fine wire below .003" diameter in silver, nickel, copper, nickel chrome and aluminum alloy; also silver, tungsten, molybdenum and alloy wire up to .010" clad with gold, copper or other materials. When you have a fine-wire problem, call on our specialized engineering service.

NORELCO PRODUCTS: In addition to fine wire and diamond dies for our own drawing, we make: Tungsten and Molybdenum products; Quartz Oscillator Plates; Amplifier, Transmitting, Rectifier and Cathode Ray Tubes; Searchray (Industrial X-ray) Equipment; X-ray Diffraction Apparatus; Medical X-ray Equipment, Tubes and Accessories. When in New York, be sure to visit our Industrial Electronics Showroom.



NORELCO PRODUCTS · Also diamond dies for our own drawing; Tungsten and Molybdenum products, Quartz Oscillator Plates; Amplifier, Transmitting, Rectifier and Cathode Ray Tubes; Searchray (X-ray) Equipment; X-ray Diffraction Apparatus; Medical X-ray Equipment, Tubes and Accessories; Electronic Measuring Instruments; High Frequency Heating Equipment: Communications Equipment. • When in New York, visit our Industrial Showroom

*Norelco* Reg. U. S. Pat. Off. *Electronic Products by* **NORTH AMERICAN PHILIPS COMPANY, INC.**

Dept. FW-2, Executive Offices: 100 East 42nd Street, New York 17, N. Y.
Factories in Dobbs Ferry, N. Y.; Mount Vernon, N. Y. (Metalix Div.); Lewiston, Me. (Elmet Div.)

### Leaflets Describe Grinding Wheel Markings

**THE Norton Company,** Worcester 6, Mass., has issued two new leaflets on the new standard markings for grinding wheels recently adopted by members of the Grinding Wheel Manufacturers Association. The first of these covers the grinding wheels affected by the change, and gives old and new markings. The second covers diamond wheels, which while not affected by the agreement, have been re-marked to bring the markings as nearly into line with the new standard markings as the nature of the product will permit. Users of these wheels are at liberty to send for these leaflets to bring their grinding wheel files up-to-date.

✦ ✦ ✦

### Announce New Capstan For Insulated Wire

**JOHN ROYLE and Sons,** Paterson 3, N. J., recently announced a new 36″ high speed capstan for resin insulated wire.

✦ ✦ ✦

THE mechanism is covered with a stainless, watertight enclosure designed to permit of higher wire speeds. A new wire puller stabilizes wire speeds. It is quiet running, has maximum accessibility and interior surfaces touched by wire or spray are of aluminum or corrosion-resisting metal to withstand the chemical reaction of the various resins. Bearings are located outside the enclosure to prevent contact with liquids.

✦ ✦ ✦

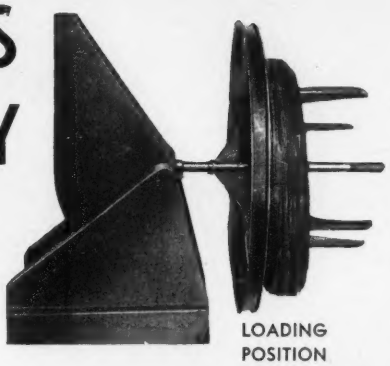
COMPLETE details may be received by writing the Company.

✦ ✦ ✦

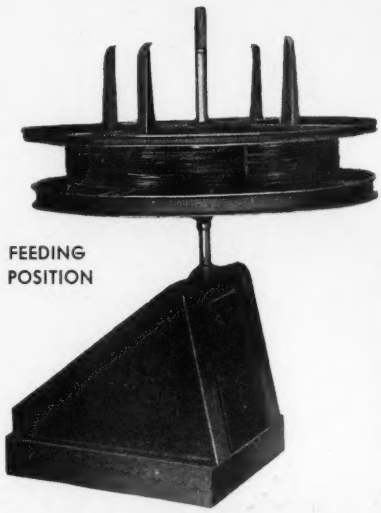
### Issues Die Price List

**THE Wickwire-Spencer Metallurgical Corp.,** 260 Sherman Avenue, Newark 5, N. J., has issued a new bulletin covering their tungsten carbide wire drawing dies, which are furnished blank, rough cored, rough drilled or finished. Besides prices, detailed specifications are given. The die numbers covered range from R-1 to R-12. In addition to round wire drawing dies, the Company makes shaped, extrusion, tube drawing, and cold heading dies, mandrels, mandrel nibs, bushings and molybdenum and tungsten wire and powders. Copies of this folder may be secured by writing the Company.


# HANDLE COILS THE EASY WAY



LOADING POSITION



FEEDING POSITION

**MOSLO SHIFTWEIGHT REEL**

eliminates need for an extra man handling heavy coils of wire. Automatically shifting counterweight holds reel steady in loading or feeding position. Easy to load without lifting. Feeds smoothly, kink-free.

Write for complete line bulletin.

***MOSLO MACHINERY COMPANY***

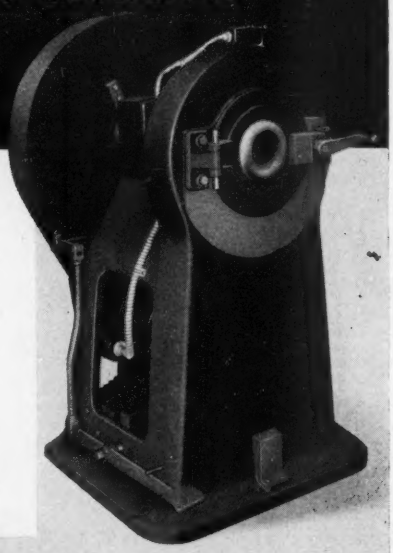
2441 PROSPECT AVENUE • CLEVELAND, OHIO

# "Standard" SWAGING MACHINE

## 5,000

EXACTLY CONTROLLED HAMMER BLOWS

## PER MINUTE



The perfect answer for reducing, pointing and forming tubing or bar stock and for positive attachment of fittings to tubing, wire or cable.

1. Work is formed without loss of material.
2. Swaging improves physical characteristics of metal.
3. Parts have smooth high finish and are accurately sized.
4. Unskilled operators can be used.

Write for Catalog Section SM or specific engineering recommendations.

**STANDARD MACHINERY COMPANY**

1545 ELMWOOD AVE., PROVIDENCE 7, R. I.

# NILSON

AUTOMATIC PRESS
and
FOUR SLIDE MACHINE

FOR SWAGING, STAMPING, PIERCING, BLANKING, FORMING OF COILED METAL

WE also build machines for forming Paper Clips, Buckles, Gate Hooks, Coat and Hat Hooks, Ceiling Hooks, Wire Ears, Cable Rings, Screw Eyes, Sash Chains, Automobile Side Chains, Flat Open Link Chains, Staples, Cotter Pins, Hose Clamps, Etc., and Wire Straighteners, Wire Reels, Frame Bending Machines and Special Presses.

*For Complete Details Address—*

## THE A. H. NILSON MACHINE CO.

BRIDGEPORT, CONN., U. S. A.



# NEW — AND BETTER

PATENTING
TEMPERING
ANNEALING

The *Trauwood* PROCESS

OUTSTANDING ADVANTAGES

Higher and more uniform physical and fatigue properties.

No surface decarburization or scale. Faster wire speeds . . . greater production.

Equipment fully automatic and easy to operate.

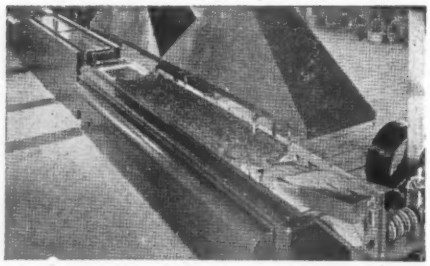
Control of heating and cooling cycles extremely accurate.

Thermal efficiency of the process very high.

Much finer grained structure possible.

High quenching temperatures rapidly attained.

Adaptable to high alloy and austenitic steel wire and strip (annealing of stainless).



Trauwood Electric Wire Tempering and Patenting Unit

The Trauwood Process, new in priniiple, eliminates high temperature furnaces and lead pots with their excessive maintenance costs and low thermal efficiencies. More positive temperature control is possible and quenching is done in a RISING temperature—instead of falling, as in conventional heat treating methods. The rapid rate of heating (4 to 5 times as fast as furnace heating) increases production and uniformly produces a finer grained product with higher physical and fatigue values.

Wire and rod patented by the Trauwood Process insures easier drafting and makes heavier reductions possible. In conjunction with the Trauwood patenting equipment, pickling, coating and baking can be made continuous, eliminating expensive handling and delay, materially reducing costs as compared with ordinary methods.

Complete details of the Trauwood Process will be furnished you on request. Our engineers will help you solve your continuous wire and strip patenting, tempering, and annealing problems. Write today.

## THE TRAUWOOD ENGINEERING COMPANY

1740 E. 23rd STREET, CLEVELAND, OHIO, U.S.A.


## New Books On Commercial Waxes

TO fill a long-felt need for an up-to-date book on natural and synthetic waxes and wax-like materials which, in modern times, find an extensive use in many industries, **Chemical Publishing Company,** 26 Court St., Brooklyn, N. Y., has brought out a book selling for $11.00, called "Commercial Waxes."

✦ ✦ ✦

ALL classes of waxes, such as mineral, vegetable, animal, insect, synthetic and compounded waxes are discussed in detail. The various data such as melting point, form and fracture, purity, hardness, flexibility, moldability, adhesiveness, solubility and many other properties, including sources and uses, are all listed in this comprehensive study. Of particular value is the section on handling and compounding waxes. The tables of compatabilities of waxes with each other, as well as resins, plastics and other materials are an important feature of the book.

✦ ✦ ✦

IT includes a glossary of terms and wax formulary giving the most useful formulae of commercial materials containing waxes, such as adhesives, agricultural specialties, materials of construction, protective and decorative coatings, stencil paper and ink, photography, soaps and cleaners, lubricants, and so forth.

✦ ✦ ✦

## Catalog of Technical Books

A new catalog of technical books has just been issued by **The Chemical Publishing Co., Inc.,** 26 Court Street, Brooklyn 2, N. Y., which includes the latest books on chemistry, technology, physics, general science, mathematics, engineering, foods, formularies, drugs and cosmetics, gardening, medicine, metals, technical dictionaries, etc.

✦ ✦ ✦

THIS catalog, conforming with the requests of technical and scientific workers and librarians, gives the date of publication of each book as well as price, number of pages, detailed descriptions and full table of contents.

✦ ✦ ✦

A copy will be sent free to everyone who is interested.

## New Bulletin on Reel Borers

THE B. M. Root Company, York, Pa., has published a new bulletin describing Model "AMRH", which is an electro-hydraulic, verticle, double column, multiple spindle machine. A feature of this borer is the hydraulic feed, which gives a stepless range of speeds from 2 to 29 strokes per minute, speed changes being made instantaneously by means of a foot control, which starts, stops, reverses or changes speeds.

✦ ✦ ✦

THIS borer will make many holes simultaneously in one operation in the wooden heads of reels for cable and wire, but may be used also for other classes of boring. The Company also makes a full range of sizes of borers, from single spindle types up to this large model.

✦ ✦ ✦

THE Company will be glad to mail copies of this bulletin to interested persons. It is illustrated and contains complete technical data and specifications.

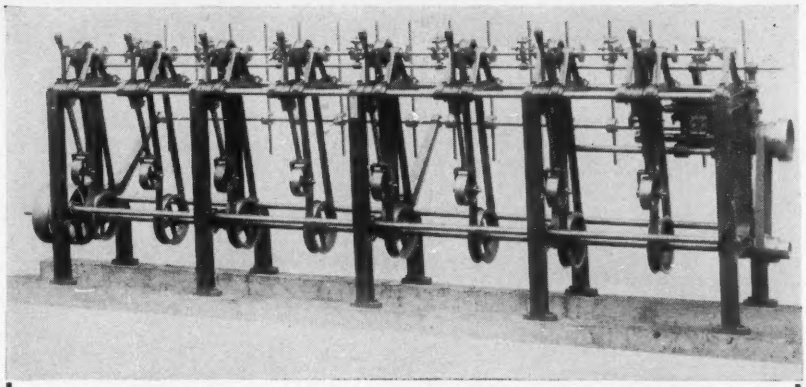
✦ ✦ ✦

## Catalog on Material Handling Trucks

THE Lewis-Shepard Company of 300 Walnut Street, Watertown, announces that its new General Catalog, No. 22 is just off the press, and was presented for the first time at the Power Show in Madison Square Garden in New York.

✦ ✦ ✦

THIS new publication contains 76 pages and cover with a special file tab and is printed in three colors. All the installation photographs are reproduced in duotone. This printing process gives the third dimension to pictures of the Materials Handling Equipment shown in operation. Another feature is the large size illustrations of the actual equipment. There are special sections on Lift Trucks, Skid Platforms, Power Fork Trucks, Stackers, Cranes, Floormaster Floor Trucks, Storage Racks and a large selection of specially built equipment for unusual jobs in production, process and storage.

No. 1900E SPOOLER

**WIRE SPOOLING MACHINES**

Model illustrated takes spools up to 12" diameter. Floor space required: 19" x 10'; length can be varied to suit largest spool specified. Handles wire up to .050" diameter. Other models made to suit specific requirements.

EMORY SPOOLERS are built for years of continuous service. Precision made, durable, rugged, dependable.

BUILDERS OF WIRE SPOOLING MACHINERY for A HALF CENTURY

For details, write to

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*AMPLE STOCK OF WIRE DIES FOR IMMEDIATE DELIVERY*

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GRAND STREET & MORGAN AVENUE
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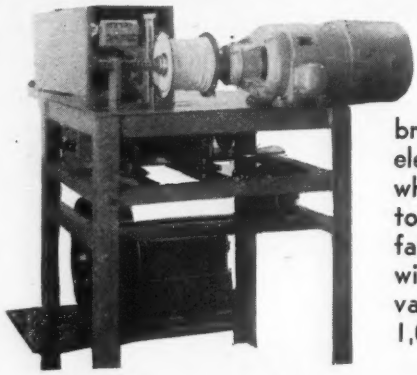
PRECISION UNIFORMITY

# SPARKER for SPOOLING
## SMALL WIRES

THIS APPARATUS WILL AUTOMATICALLY STOP WHEN DIELECTRIC FAULT OCCURS, or when the machine has wound a predetermined length of wire.



It is equipped with a gear head motor, electrical brakes on take-up and pay-off, electrode, control apparatus which automatically reduces the torque of the motor in starting, fault light indicator, transformer with tap switch, volt meter, and variac. Range of voltage from 1,000 to 16,000 volts.

Please Address Inquiries To:

**R. L. DAVIS ELECTRIC CO., INC.**

WALLINGFORD, CONN.

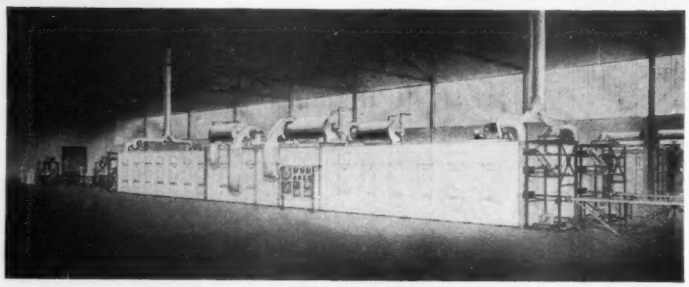


# MORE PRODUCTION IN LESS TIME *with*

CARL-MAYER HI-SPEED
ROD BAKER

The fastest rod baker built! Saves up to 50% in time and fuel. Patented Blow-Off Feature removes moisture without bumping or agitating the coils. **Patented and patents pending.**

**CARL-MAYER FURNACES, OVENS**



WELDING ROD OVEN

For drying coated welding rods. Uses the "Mayer" Recirculating Gas Fired Air Heater principle and Rod Transfer Systems (patents pending).

**Growing interest in our type of equipment is evidenced by Carl-Mayer installations in such plants as:—**

Atlantic Wire Co.
Atlas Tack Corp.
Atlas Steel Co.
Eaton Mfg. Co.
Hollup Corp.
Johnson & Nephew Ltd.
Page Steel & Wire Co.
WRITE for BULLETIN No. 241
Pittsburgh Tool Steel Wire Co.
Steel Co. of Canada
Wickwire Spencer Steel Co.

**THE CARL-MAYER CORPORATION** 3030 EUCLID AVENUE CLEVELAND, OHIO


### Increased Demand for Wire

IN establishing a vast network of military communications in France and on the French front, **Signal Corps** and other communications troops are using an average of 2200 miles of wire a day and, as of early November, had laid approximately 330,000 miles since D-Day in Normandy.

✦ ✦ ✦

TO keep this network in operation considerably more than 200,000 tons of communications equipment have been moved across the beaches and through the rehabilitated ports, according to recent reports from the European Theater to Major General H. C. Ingles, Chief Signal Officer.

✦ ✦ ✦

IT is this unprecedented demand for wire in France and in other theaters and the prospect of continuing expenditures on a large scale that has impelled the High Command to ask American industry and labor for increased wire production.

✦ ✦ ✦

IT is believed that no network of the size and complexity of that now operating in France ever was built so quickly under combat conditions. During the racing pursuit of the Nazis across France wire men had to resort to many expedients to keep the field generals in touch with rear headquarters and supply dumps. To save time, short, thin, pointed poles were often sledge-hammered into the ground in place of the large heavy poles which must be dug in. The rapidly strung wire barely cleared the ground.

✦ ✦ ✦

SOMETIMES communications soldiers were too rushed even for this. Cable, wrapped in rubber tubing and spiralled to increase its capacity, was rolled out alongside the hedgerows and strung from trees and bushes. The quarter-mile-long sections were plugged together to lock by vacuum. Plain field wire, normally only a combat zone expedient, was also used. But they did not fail to spin some kind of a communications web to keep the forces together. Communications kept pace with the fighting armies every inch of the way.

MORE than 140 principal headquarters are now connected by long-distance telephone lines. One of these headquarters alone has 2100 local telephones, handles 30,000 calls a day, almost two-and-a-half times the amount of telephone service the Germans had at the same location after four years of occupation. Through the principal switching centers, more than 700 points can be reached.

✦ ✦ ✦

MANY civilian telephone lines in France were found to be out of commission, not along from the carefully planned destruction left behind by the retreating enemy, but by the even greater and more complete destruction caused by our own pin point bombing and by four years of French sabotage against the Germans. These lines are rapidly being put back into condition in order to utilize every available means of communication. Thus Signal construction battalions are now putting up permanent lines with heavy poles carrying three and four cross arms.

✦ ✦ ✦

TELEPRINTER is the most efficient and expeditious method of transmitting written messages. Today more than 107 principal headquarters, dumps, depots, and railheads are connected in a radio and wire teleprinter net, so that written messages can be transmitted almost instantaneously between them. The wires stretch along the country roads, from tree to tree and pole to pole, through hedgerows and wheat fields, connecting armies with their vital supply lines.

✦ ✦ ✦

### Wickwire Spencer Appoints Hoenstein Superintendent at Mt. Wolf Plant

THE **Wickwire Spencer Steel Company** announced recently the appointment of **R. L. Hoenstein** as Superintendent of the Mt. Wolf, Pennsylvania plant of the Company.

✦ ✦ ✦

MR. **Hoenstein** has long been associated with **Wickwire Spencer** and has recently been chief chemist at Mt. Wolf. This plant of the Company is the chief manufacturing unit of the American Wire Fabrics Corporation, a Wickwire Spencer subsidiary. Screen cloth is manufactured at this plant, which has the country's largest capacity.


**TUNGSTEN CARBIDE DIES for HEADING and**

WIRE AND TUBE DRAWING (.030" to 2"), EXTRUSION (1/16" to 1"), RECUTTING AND WELDING ELECTRODE COATING.

RING GAUGES
DIAMOND DIES (.0015" up)
DIAMOND POWDER IN ALL GRADES

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## Cleaner Wire The Oakite Way!

**To get cleaner finished wire, immerse steel rods, after pickling, in recommended solution of**

OAKITE
COMPOSITION No. 24

**Because this specially formulated material removes smut and other foreign matter speedily and completely, wire is cleaner for lime coating. Moreover, a heavier, more tenacious adhering lime coat is obtained. Improved lubrication results. Oakite Composition No. 24 helps in reducing baking time. Send for further data . . . no obligation.**

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*Consulting and Research Engineers*

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### Common Pins and Safety Pins

ENOUGH safety pins are being made to meet essential requirements, and the number of common pins available is slightly below minimum requirements, but the manpower shortage does not allow production to be increased beyond this level, members said at the recent meeting of the newly-appointed Common and Safety Pin Manufacturers Industry Advisory Committee.

✦ ✦ ✦

THE industry is obtaining delivery of steel in sufficient quantity in relation to its ability to put it into production, the committee said. WPB officials pointed out that steel wire in all finishes and grades, particularly in finer gauges, is becoming more difficult to obtain. This is due to high military requirements for wire to be used in the production of communications wire, wire rope, screen cloth, and other critical items, they explained. WPB representatives suggested that pin manufacturers explore the possibility of using idle and excess stocks of steel wire, obtainable in accordance with the provisions of Direction 44 to CMP Regulation 1.

✦ ✦ ✦

WPB recently permitted the industry to resume the use of brass, prohibited for pins for civilians about three years ago, but military requirements for brass mill products for ammunition production have been increased to such an extent that delivery of brass on allotments to pin manufacturers will probably be seriously affected.

✦ ✦ ✦

### The Aluminum Situation

**THE Aluminum Industry Advisory Committee** was informed by WPB officials at a recent meeting that resurgent war demands in the first six months of 1945 might cause a tightening in what was thought to be an easy situation in regard to aluminum. The chief difficulty, it was indicated, was a shortage of manpower in the fabricating plants, rather than in the supply of the basic metal itself.


*More* **POWER TO YOUR HANDS**

With a Porter cutter you can cut hard wire (with center cut round edge jaws), spring wire, wire fabric, tie wire — anywhere, easily and quickly.

There is a standard Porter tool for every cutting job. Special heads designed for special operations.

A special Bench Cutter for stranded airplane control cable. Write for catalog of Porter cutting tools.

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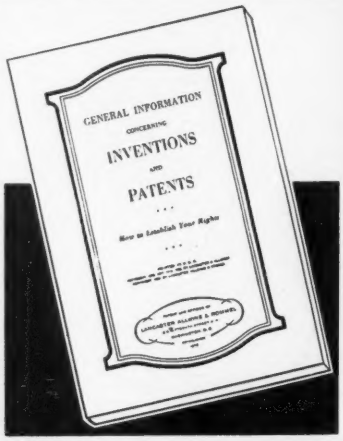
PORTER HKP CUTTERS



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## Wire Screen Cloth

TENTATIVE proposals for 1945 indicate that civilians will receive only about half the amount of wire screen cloth that they did in 1944, WPB officials revealed at a recent meeting of the Insect Wire Screen Cloth, I.A.C.

✦ ✦ ✦

ESTIMATES show that there are somewhat over three billion square feet of wire insect screen cloth in use today. It is estimated that two billion square feet are in various stages of deterioration. One billion square feet is of copper and bronze. It is estimated that there is a shortage of 250 million square feet required for patching and repair alone.

✦ ✦ ✦

HOWEVER, tow target requirements of the Army Air Corps are so essential that if necessary civilian supplies should be curtailed to meet the demand. To defeat the Japanese the Air Corps will have to use superior gunnery and practice requires tow targets made of screen cloth. A new program requiring brass wire screen cloth was revealed by representatives of the Chemical Warfare Service. It is for a newly developed combat mask which is carried by every man landing upon an enemy shore. Heaviest requirements are for screening mess halls, kitchens and hospitals in malarial areas. The navy use of screen cloth, representatives of this service said, parallels that of the army. Requirements have increased because the navy is operating in the same areas as the army. There are over 300 advance bases in the Pacific, each the size of a small city. The navy is looking to the industry to increase production.

✦ ✦ ✦

## New Issue of Graphic Out

THE Cleveland Crane & Engineering Company, 1129 East 283rd St., Wickliffe, Ohio has published its first 1945 issue of the Cleveland Crane Graphic. As to contains illustrations and descriptions of many applications of their material handling equipment for steel mills, it should be of interest to many of our readers, who may secure a copy by asking for Vol. 3, No. 1 of this publication.


Wartime
Wire for a thousand uses

Versatile Continental wire is produced in sizes from 34 gauge to ½ inch, in standard and special shapes . . . and in a wide range of analyses, tempers and coatings.

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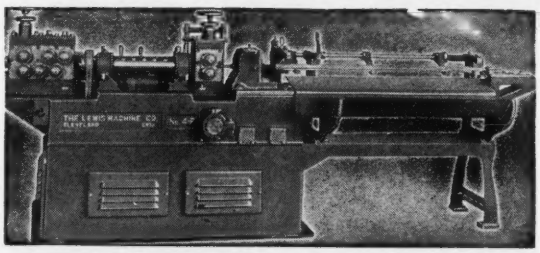
LEWIS TRAVEL-CUT WIRE STRAIGHTENING and CUTTING Machines



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Ferrous and Non-Ferrous

Automatic
High Speed
Heavy Duty

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WIRE MEASURING MACHINE
FOR LINEAR MEASURE
PROVIDES NEW STANDARD OF ACCURACY

Illustration Shows Exclusive Patented "3V" Principle

Measuring twisted, armored, bare or insulated wire without vibration or inaccuracies at any speed or varying speeds!

97 Belmont Street, BROCKTON, Massachusetts
LYON-VAIL MACHINE CO., INC.
*Write for Information and Prices*

LYONBILT

## Announces New Steam Jet Agitator for Pickling Tanks

THE Youngstown Welding and Engineering Company, Youngstown 9, Ohio, has issued a folder which is available upon request, describing the WELDCO efficiency type steam jet agitator for pickling liquids, which heats, agitates and circulates the liquid. The folder describes and illustrates the equipment, which may be quickly installed in existing pickling tanks for better operation.

## Carbide Mandrel Effectiveness Increased by Proper Application and Maintenance

*(Continued from page 135)*

maintained on the front end of the mandrel nib by grinding it with a 10 grit diamond wheel, or by turning with a diamond boring tool in a lathe.

✦ ✦ ✦

ONE precaution which it will be found well to observe when setting up the tube is to make sure that the tube does not strike the end of the mandrel with too great force when the tube is being pulled over the mandrel rod prior to the drawing set-up. Constant pounding on the end of the mandrel may cause the cemented carbide to chip off the front end and develop longitudinal cracks in the nib.

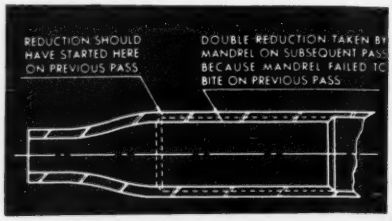

REDUCTION SHOULD HAVE STARTED HERE ON PREVIOUS PASS
DOUBLE REDUCTION TAKEN BY MANDREL ON SUBSEQUENT PASS BECAUSE MANDREL FAILED TO BITE ON PREVIOUS PASS

**Fig. 6. To avoid this condition maintain a sharp edged chamfer on front end of nib.** ✦ ✦

✦ ✦ ✦

FOR best results tubing should be trimmed regularly. After a tube has been drawn through several passes, the elongation which the tube has undergone will cause a scalloped back end to develop as diagrammed in Figure 7. When a tube in this condition is drawn over the mandrel, considerable stress is set up and the mandrel is twisted just as the back end of the tube leaves the nib. Trimming the back end of the tube before it becomes too scalloped will materially aid in lengthening the life of the carbide mandrel.

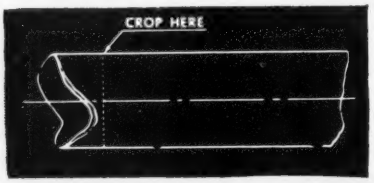
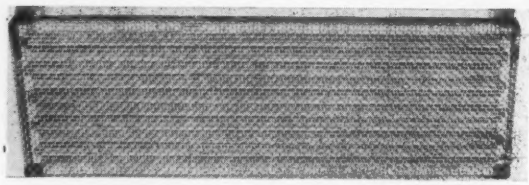



**Fig. 7. Trim back end of tube where excessive scallop develops.** ✦ ✦ ✦

✦ ✦ ✦

THESE simple principles have been found to greatly increase the effectiveness of carbide mandrels in tube mills. Neglecting them on the other hand may result in sacrificing a considerable portion of the better inside finish, closer tolerances on long runs, higher drawing speeds, increased footage per day, and longer mandrel life made possible through the use of carbide precision mandrels and dies.

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Apco Mossberg Steel Reels are standard throughout the wire industry – and for good reason! Apco Mossberg – the original Frank Mossberg Co. – *originated* the steel reel idea and have been training workmen in their manufacture ever since. That is why Apco Mossberg Steel Reels are preferred where the pressure of wartime production schedules is heaviest.

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(The Original Frank Mossberg Co.)
21 Lamb Street . . . Attleboro, Mass.

## New Wire Rope Simplification Program Meets with Ready Response

### Bureau of Standards Issues Recommendation No. R-198-43

EDWIN W. ELY, chief, Division of Simplified Practice, National Bureau of Standards issues the following commentary:

✦ ✦ ✦

"SIMPLIFIED Practice Recommendation R-198-43, wire rope, became effective on February 15, 1943. It has been made available in printed form since April 6, and more than 20,000 copies of the booklet have been sold by the Superintendent of Documents, Government Printing Office.

✦ ✦ ✦

"THE Division of Simplified Practice has availed itself of every opportunity to lengthen the list of recorded acceptors, thereby increasing adherence to this voluntary simplification program. The results have been gratifying, measured by the number of firms and individuals that have detached page 13 of the printed pamphlet, filled it in and mailed it to us for our record."

✦ ✦ ✦

### Advantages

WIRE rope users will benefit by having available more of the needed ropes in stock. For users it means better service in delivery and repair as well.

✦ ✦ ✦

REDUCING the number of ropes made, means that more attention can be paid to greater and faster production of ropes most widely used.

✦ ✦ ✦

### Changes Made

ONE of the principal changes made through simplified practice is the complete elimination of all sizes and constructions of cast steel ropes both bright and galvanized.

✦ ✦ ✦

OTHER changes are in revised breaking strengths and elimination of some construction of other grades.

### Four Principal Grades

THERE are four principal grades of material now covered by simplified practice. They are iron, mild plow steel, plow steel and improved plow steel.

✦ ✦ ✦

THE following table shows the construction and grades covered by simplified practice, manufactured by Macwhyte Company.

✦ ✦ ✦

### Ordering Suggestions

MACWHYTE Company has adopted the new simplified practice and will put it into effect as soon as practical. When ordering wire rope it is always wise to specify the equipment for which the rope is to be used. It may be possible that there is available on shorter notice a wire rope which will serve equally well.

✦ ✦ ✦

BY giving your wire rope source of supply an opportunity to suggest a rope on which they can give better delivery, you may help your supplier give you better service.

✦ ✦ ✦

### Wire Rope Very Critical

IN an emergency such as now exists, manufacturers are very hard put to make deliveries. Ropes that may not be available this week may be available next week.

✦ ✦ ✦

WIRE rope is not a packaged product, it must be made in long lengths and each order requires different lengths cut from master reels.

*(Please turn to page 160)*

BELL-MINE LIME

Warner

*for*

WIRE DRAWING

Warner Company

BELLEFONTE DIVISION

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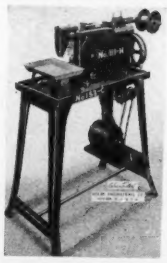
WIRE CUTTING and SHAPING MACHINES, FINE WIRE WELDERS Spot Welder

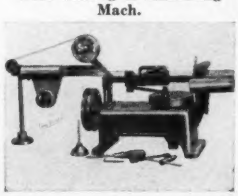
*We make Spot Welders from ¼ to 500 KVA & all Types Butt Welders*

Automatic Drawing and Cutting Mach.



Eisler fine wire cutting and forming machines have been in use over twenty-five years.

Wire Cutting & Annealing Mach.



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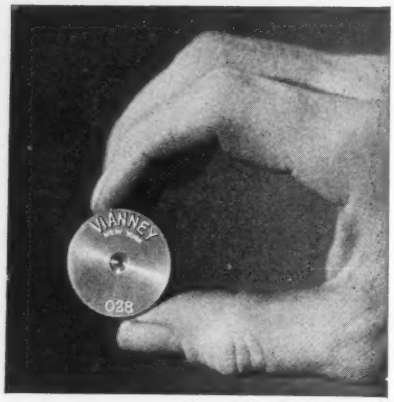
**VIANNEY**

Famous Wire Drawing Diamond Dies




These famous Diamond Dies
are now produced here
at moderate prices.

All sizes are in stock
or made to order
to your specifications

**VIANNEY WIRE DIE WORKS**

250 E. 43rd St., New York.
V. J. Boulin, Manager

## New Wire Rope Simplification Program Meets with Ready Response

*(Continued from page 159)*

ALL sizes, grades and constructions of wire rope cannot be manufactured at one time; there aren't enough men, machines, and time available.

✦ ✦ ✦

SO rope orders must be assembled by size, grade, and construction for manufacturing in long lengths.

✦ ✦ ✦

FOR example, John Jones may send in an order for 5/8" rope and get immediate delivery. Why? Because a reel just came off the closing machines and there happened to be an odd length left, after taking care of standing orders, so he got it.

✦ ✦ ✦

PAUL Smith hears about the rope John Jones got so he sends in an order for the same rope for the same purpose and he gets a delayed delivery promise. So Paul wonders 'how come,' because John just got some. Well, you can see why — because there 'ain't no more' until that particular size, grade, and construction can be made again. This means that material must be available, wire drawn and stranded, and rope fabricated. In normal times, the manufacturers and distributors plan ahead and carry the burden of stocking the ropes for immediate delivery. (At present stocks are reduced and some times do not exist).

✦ ✦ ✦

### Simplified Practice Will Help

SO we can all see why we need simplified practice to cut down the number of items so more can be made at a run and the periods between runs of a certain size, grade and construction can be reduced to give everybody a better break.

✦ ✦ ✦

### You Never Know For Sure

YOU never know for sure about deliveries now so don't give up. Keep in touch with your source and just because they may not have it the first time you need it, give them a chance to see if they might take care of you

**Balloffet DIAMOND DIES**

Balloffet's efficient bearing . . . Preselected stones—highly polished surfaces . . . overall quality plus skillful workmanship assure greater wire drawing mileage.

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|---|---|---|---|---|---|
| 6x19 | X | X | X | X | X |
| 6x7 | — | — | X | X | X |
| 8x19 | X | X | — | X | X |
| 6x37 | — | — | — | X | X |
| 6x42 | X | — | — | X | — |
| 18x7 | — | — | — | X | X |

**GALVANIZED ROPES**

| Construction | Galvanized Iron | Galvanized Plow Steel | Galvanized Monarch |
|---|---|---|---|
| 6x7 | X | — | — |
| 6x12 | X | X | X |
| 6x24 | — | X | X |
| 6x37 | — | X | X |

✦ ✦ ✦

## Cable Carrier Systems

SPIRAL-FOUR cable carrier systems are being used by the **United States Army Signal Corps** in various war theaters not only to increase the talking range but also to provide additional channels of communication. This cable was especially designed for use with carrier equipment and contains two pairs in spiral arrangement, each having loading coils at quarter-mile intervals. The carrier system will operate at distances up to 150 miles when spiral-four is used as an aerial cable or laid on the ground, and at distances of at least 400 miles when it is buried underground. For systems using two or more intermediate repeaters it has been found desirable to use the cable either underground or as aerial construction, with average repeater spacing of approximately 25 miles.

✦ ✦ ✦

REPORTS indicate that up-to-date Telephone Terminals developed by the Signal Corps require little adjustment, once installed. The gains of the telephone terminals and repeaters, if adjusted properly when first installed, require only periodic

*(Please turn to page 162)*


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forms round, flat or square wire to accurately duplicated shapes.
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60 Models for WIRE, RUBBER, TEXTILES, PAPER, ETC.
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*Standard of the World*

TORRINGTON SPRING COILERS
13 models in both segment and clutch types for rapid, automatic, accurate production using wire diameters .033" to .500". Torsion and other attachments available for increasing utility of Torrington Coilers.
The TORRINGTON MANUFACTURING CO.
TORRINGTON, CONNECTICUT

## Cable Carriers Systems

*(Continued from page 161)*

changes thereafter to compensate for variations in attenuation caused by changes in temperature. Experience has shown that daily inspections and a weekly line-up of the system is usually sufficient, except when there is a radical change in temperature. Routine tests are made when the traffic is low. The alignment of the channels remains fairly constant.

✦ ✦ ✦

A report from one theater states that spiral-four cable provides the most satisfactory means of communication for carrier systems. Its installation requires fewer manhours than the construction of an equivalent amount of open wire line.

✦ ✦ ✦

SPIRAL-FOUR installations must be protected from friendly vehicles as well as from the weather and enemy action. It has been found preferable to hang the cable from trees parallel to the road, using messenger wire only when needed because of excessive spans. Placing the poles prominently along the inner shoulders of the highway makes their mortality from military traffic high.

✦ ✦ ✦

A spiral-four carrier system in England has been in continuous operation since May, 1944, with 60 miles of cable suspended, in this case, from poles. Three telephone, four teletypewriter and two d-c ground return simplex circuits are provided. The repeaters are spaced approximately 20 miles from the terminals and located in private buildings. In order to facilitate maintenance, an alarm and signalling circuit operating over one of the simplex circuits is used for signaling between the carrier terminals and intermediate repeaters. Since this carrier system was first installed it has given excellent service with only a two-minute interruption in service on one occasion caused by a tube burning out.

✦ ✦ ✦

THE spiral-four cable is hung unsupported between poles except at highway crossings and through some towns where the cable is supported by messenger wire. The cable is fastened to the poles by means of open helix spring hangers which are plac-

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ed on drive hooks. The method has been useful, for when a pole is struck by a vehicle the spring hanger jumps off the hook, allowing the pole to fall free of the cable. This has happened in two cases and necessitated only replacing the pole. Recently several bombs were dropped in the immediate vicinity of the pole line and although open wire lines on the same pole line were damaged and put out of service, the spiral-four cable was found to be undamaged.

✦ ✦ ✦

## Order Affecting Copper Wire

COPPER wire mills are now required to notify WPB's Copper Division ten days in advance of scheduling orders bearing Z-1 allotments, the War Production Board announces. This action was taken in Direction 60 to Controlled Materials Plan Regulation No. 1.

✦ ✦ ✦

DIRECTION 60 provides for the substitution of Army and Navy orders for such deferred orders. The Army Signal Corps demand will require, for communication wire alone, the fullest utilization of copper wire mill facilities.

✦ ✦ ✦

THIS new direction affecting copper wire mills parallels the action taken on December 28, 1944, requiring brass mills to give five days notice to the Copper Division before scheduling deferred orders, through issuance of Direction 58 to CMP Regulation 1.

✦ ✦ ✦

COPPER wire mills are also required to furnish WPB with information regarding the amount and identification of type of copper wire mill products involved in such orders and also to advise WPB as soon as possible regarding "Z" orders that have been scheduled before date of issuance of this direction but not yet put into production.

✦ ✦ ✦

IN any event, brass and copper wire mills located in critical labor areas and having unfilled requisitions with USES will not be in a position to accept or schedule "Z" orders even though such orders are handled on a deferred basis.

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**ABRASIVES—**
Norton Co., Worcester, Mass.

**ACID INHIBITORS—**
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

**ACID-PROOF CONSTRUCTION—**
Ceilcote Co., The, Cleveland, Ohio
Haveg Corp., Newark, Del.
Heil Engineering Co., Cleveland, Ohio
Nukem Products Co., Buffalo, S. Y.
Sauereisen Cements Co., Pittsburgh, Pa.

**AIR DRAW FURNACES—**
Carl-Mayer Corp., The, Cleveland, Ohio.

**ALKALINE CLEANERS—**
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.

**ANNEALING MACHINES—**
**Open Flame**
Syncro Machine Co., Perth Amboy, N. J.

**ANNEALING POTS AND BOXES—**
National Annealing Box Co., Washington, Penna.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.

**ARMORING EQUIPMENT—**
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

**BAKERS—Rod and Wire**
Carl-Mayer Corp., The, Cleveland, Ohio
Morgan Construction Co., Worcester, Mass.
Moslo Machinery Co., Cleveland, Ohio.
Ross, J. O., Engineering Corp., New York, N. Y.

**BELTS—Wire**
Wickwire Spencer Steel Co., Sew York, N. Y.

**BENDERS—**
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

**BOBBINS—Braider & Wire Weaving**
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

**BORON CARBIDE—**
Norton Co., Worcester, Mass.

**BRAKES & SHEARS—**
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

**BRICKS—Acid Proof**
Keagler Brick Co., Steubenville, Ohio.
Nukem Products Co., Buffalo, N. Y.

**CABLE LACQUERING OVENS**
Industrial Oven Engr. Co., Cleveland, Ohio.

**CABLE—Steel and Copper**
Bethlehem Steel Co., Bethlehem, Pa.
Brewer Mfg. Co., Muncy, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Wickwire Spencer Steel Co., New York, N.Y.

**CARRIERS—Braider, High Speed**
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.

**CASTINGS—Wire Mill**
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.

**CEMENTS—Acid Proof**
Sauereisen Cement Co., Pittsburgh, Pa.

**CEMENTS—Refractory**
Norton Co., Worcester, Mass.

**CHEMICALS—Cleaning**
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.
Standard Industrial Compounds Co., Chicago, Ill.

**CLEANERS—Hand and Metal**
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

**CLEANING & PICKLING EQUIP.**
Broden Construction Co., Cleveland, O.
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Haveg Corporation, Newark, Del.
Heil Engineering Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Nukem Products Corp., Buffalo, N. Y.
Vaughn Machinery Co., Cuyahiga Folls, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

**CLOTH TESTERS—**
Scott, Henry L., Co., Providence, R. I.

**CLOTH—WIRE, All Metals**
Roebling's, John A. Sons, Co., Trenton, N. J.
Wickwire Spencer Steel Co., New York, N. Y.

**COATING COMPOUNDS—**
Apex Alkali Products Co., Philadelphia, Pa.
Gilron Products Co., Cleveland, Ohio.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

**COILERS—Sheet, Strip and Wire**
Broden Construction Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.

**COLD HEADERS—**
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

**COMPOUNDS—Coppering**
American Chemical Paint Co., Ambler, Pa.

**COMPOUNDS—Metal Finishing**
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.

**COMPOUNDS—Rust Preventing**
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.
Shell Oil Co., New York, N. Y.

**COMPOUNDS—Rust Removing**
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Shell Oil Co., New York, N. Y.
Standard Industrial Compounds, Inc., Chicago, Ill.

**COMPOUNDS—Wire Drawing**
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Gilron Products Co., Cleveland, Ohio.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Potter, Neil C., Newark, N. J.
Shell Oil Co., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

**COPHOLDERS—Steel**
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

**CRANES—Wire Mill**
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

**CUTTING TOOLS—Carbide**
Carboloy Co., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Vascoloy-Ramet Corp., North Chicago, Ill.

**CUTTING TOOLS—Wire**
Porter, H. K., Inc., Everett, Mass.

**DIAMONDS—Industrial**
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vianney Wire Die Wks., New York, N. Y.

**DIAMOND POWDERS—**
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.

**DIAMOND TOOLS—**
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.

**DIES—Diamond**
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Cochaud Wire Die Corp., New York, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Luginbill Wire Die Co., Fort Wayne, Ind.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
United Die Co., Newark, N. J.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Wopis Industry Laboratory, Brooklyn, N. Y.

**DIES—Lead Extrusion**
Carb-Tung Products, Inc., Brooklyn, N. Y.
Robertson, John, Co., Brooklyn, N. Y.

**DIES—Repairs & Re-Cutting**
Ajax Industrial Supplies Co., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carbide Die Works, Inc., Hartford, Conn.
Carboloy Co., Inc., Detroit, Mich.
Cochaud Wire Die Corp., New York, N. Y.
Carb-Tung Products, Inc., Brooklyn, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Hartley Wire Die, Thomaston, Conn.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Luginbill Wire Die Co., Fort Wayne, Ind.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
United Die Co., Newark, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

**DIES—Rod and Tube Drawing**
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carbide Die Works, Hartford, Conn.
Carboloy Co., Inc., Detroit, Mich.
Carb-Tung Products, Inc., Brooklyn, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Hartley Wire Die, Thomaston, Conn.
Kelly Wire Die Corp., New York, N. Y.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Tungsten Electric Corp., Union City, N. J.
United Die Co., Newark, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.
Wopis Industry Laboratory, Brooklyn, N.Y.

**DIES—Tantalum Carbide**
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carbide Die Works, Hartford, Conn.
Carboloy Co., Inc., Detroit, Mich.
Carb-Tung Products, Inc., Brooklyn, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Hartley Wire Die, Thomaston, Conn.
Kelly Wire Die Corp., New York, N. Y.
Luginbill Wire Die Co., Fort Wayne, Ind.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.
Wopis Industry Laboratory, Brooklyn, N. Y.

**DIES—Tungsten Carbide**
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carbide Die Works, Inc., Hartford, Conn.
Carboloy Co., Inc., Detroit, Mich.
Carb-Tung Products, Inc., Brooklyn, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Hartley Wire Die, Thomaston, Conn.
Kelly Wire Die Corp., New York, N. Y.
Luginbill Wire Die Co., Fort Wayne, Ind.
Michigan Wire Die Works, Detroit, Mich.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Tungsten Electric Corp., Union City, N. J.
United Die Co., Newark, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

**DRAW BENCHES—**
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.
Standard Machinery Co., Providence, R. I.
Vaughn Machinery Co., Cuyahoga Falls, O.

**DRUMS—Flange Steel**
Hubbard Spool Co., Chicago, Ill.
Stevens Metal Products Co., Niles, Ohio.

**DRUMS—Vulcanizing**
Mossberg Pressed Steel Corp., Attleboro, Mass.

**DRYING & PRE-HEATING ROOMS**
Industrial Oven Engr. Co., Cleveland, Ohio.

**DRYING EQUIPMENT**
Ross, J. O., Engr. Corp., New York, N. Y.

**ELECTRIC RESISTANCE HEATING**
Trauwood Engr. Company, Cleveland, Ohio.

**ENGINEERS—Consulting Wire Mill**
Hartley, George D., Worcester, Mass.
Lewis, Kenneth B., Worcester, Mass.

**EQUIPMENT—Insulation Testing**
Davis, R. L., Electric Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.

**EYELETS—Brass or Zinc**
Platt Bros. & Co., The, Waterbury, Conn.

**FENCES AND FENCING—Wire**
Wickwire Spencer Steel Co., New York, N.Y.

**FLUXES—Soldering**
American Chemical Paint Co., Ambler, Pa.

**FOAM PRODUCING COMPOUNDS—**
American Chemical Paint Co., Ambler, Pa.
Parkin, Wm. M., Co., Pittsburgh, Pa.

# WHERE TO BUY, Continued

**FRICTION PAY-OFF STANDS—**
Industrial Oven Engr. Co., Cleveland, Ohio.

**FURNACES—Annealing**
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Pennsylvania Industrial Engrs., Pittsburgh, Pa.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Trauwood Engr. Company, Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

**FURNACES—Automatic**
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Pennsylvania Industrial Engrs., Pittsburgh, Pa.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

**FURNACES—Brazing**
Electric Furnace Co., Salem, Ohio.
Firth-Sterling Steel Co., McKeesport, Pa.
Pennsylvania Industrial Engrs., Pittsburgh, Pa.

**FURNACES—Bright Annealing**
Electric Furnace Co., Salem, Ohio.
Pennsylvania Industrial Engrs., Pittsburgh, Pa.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

**FURNACES—Electric**
Eisler Engineering Co., Newark 3, N. J.
Electric Furnace Co., Salem, Ohio.
Pennsylvania Industrial Engrs., Pittsburgh, Pa.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Trauwood Engr. Company, Cleveland, Ohio.

**FURNACES—Galvanizing Equip.**
Electric Furnace Co., Salem, Ohio.
Pennsylvania Industrial Engrs., Pittsburgh, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Surface Combustion Div. of Gen'l Properties Co., Inc., Toledo, Ohio.
Wilson, Lee, Engineering Co., Cleveland, O.

**FURNACES—Hard'ing & Temp'ing**
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Pennsylvania Industrial Engrs., Pittsburgh, Pa.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Trauwood Engr. Company, Cleveland, Ohio.

**FURNACES—Lead Melting**
Electric Furnace Co., Salem, Ohio.
Pennsylvania Industrial Engrs., Pittsburgh, Pa.
Robertson, John, Co., Brooklyn, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.

**FURNACES—Non-Oxidizing**
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Pennsylvania Industrial Engrs., Pittsburgh, Pa.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Wilson, Lee, Engineering Co., Cleveland, O.

**FURNACES—Normalizing**
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Pennsylvania Industrial Engrs., Pittsburgh, Pa.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Trauwood Engineering Co., Cleveland, Ohio

**FURNACES—Salt Bath**
Electric Furnace Co., Salem, Ohio.
Pennsylvania Industrial Engrs., Pittsburgh, Pa.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.

**FURNACES—Wire, Strip & Sheet**
Carl-Mayer Corp., The, Cleveland, Ohio.
Eisler Engineering Co., Newark 3, N. J.
Electric Furnace Co., Salem, Ohio.
Pennsylvania Industrial Engrs., Pittsburgh, Pa.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Trauwood Engineering Co., Cleveland, Ohio
Wilson, Lee, Engr. Co., Cleveland, Ohio.

**GALVANIZING KETTLES**
National Annealing Box Co., Washington, Penna.

**GRINDERS—Roll**
Norton Co., Worcester, Mass.

**HOISTS—Electric Travelling**
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

**INHIBITORS—Pickling**
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

**INSULATING LACQUERING SYSTEMS—Continuous**
Industrial Oven Engr. Co., Cleveland, Ohio.

**INSULATING MATERIALS—**
Angier Sales Corp., Framingham, Mass.
Cheney Bros., New York, N. Y.
Crepe-Kraft Co., Newark, N. J.
DuPont, E. I. de Nemours Co., Wilmington, Del.
Owens-Corning Fiberglas Corp., Toledo, O.

**KETTLES—Galvanizing, Annealing, Tinning, etc.**
National Annealing Box Co., Washington, Penna.

**LATHES—Die Reaming**
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Morgan Construction Co., Worcester, Mass.
Roos, H. & G., Tool & Mfg. Co., Montclair, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry & Machine Co., Waterbury, Conn.

**LIME—**
Warner & Company, Philadelphia & Bellefonte, Pa.

**LININGS—Acid and Alkali Proof**
Ceilcote Co., The, Cleveland, Ohio.
Haveg Corp., Newark, Del.
Heil Engineering Co., Cleveland, Ohio.

**LUBRICANTS—For Metal Cutting, Stamping and Drawing**
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Shell Oil Co., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

**LUBRICANTS—Wire Drawing**
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Potter, Neil C., Newark, N. J.
Shell Oil Co., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

**MACHINERY—Armoring (Cable, Wire Hose)**
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Robertson, John, Co., Brooklyn, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Braiding**
Fidelity Machine Co., Philadelphia, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Watson Maching Co., Paterson, N. J.

**MACHINERY—Brazing**
Syncro Machine Co., Perth Amboy, N. J.

**MACHINERY—Bunching**
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Bundling, Scrap**
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Cable, Electric**
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Chain Making**
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

**MACHINERY—Closing**
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Coil Winding**
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

**MACHINERY— Coilers**
Broden Construction Co., Cleveland, Ohio.
Eisler Engineering Co., Newark 3, N. J. (for Tungsten Wire)
Morgan Construction Co., Worcester, Mass.
New England Butt Co., Providence, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Copper Wire Drawing and Rolling**
American Insulating Mach'y Co., Phila., Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

**MACHINERY—Covering Wire**
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.

**MACHINERY—Cutting**
Broden Construction Co., Cleveland, Ohio.
Eisler Engineering Co., Newark 3, N. J.
Lewis Machine Co., The, Cleveland, Ohio.
Moslo Machinery Inc., Cleveland, Ohio.
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Porter, H. K., Inc., Everett, Mass.
Shuster, F. B., Mfg. Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Die Making**
Carboloy Co., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Roos, H. & G., Tool & Mfg. Co., Montclair, N. J.

**MACHINERY—Draw Benches**
Broden Construction Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

**MACHINERY—Edging**
Broden Construction Co., Cleveland, Ohio.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.

**MACHINERY—Enameling**
American Insulating Mach'y Co., Phila., Pa.
Industrial Oven Engineering Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.

**MACHINERY—Extruding**
Robertson, John, Co., Brooklyn, N. Y.
Royle, John, & Sons, Paterson, N. J.

**MACHINERY—Fence**
Broden Construction Corp., Cleveland, Ohio
Glader, Wm., Machine Works, Chicago, Ill.

**MACHINERY—Filament Coil Winding**
Eisler Engineering Co., Newark 3, N. J.

**MACHINERY—Flat Wire**
Broden Construction Co., Cleveland, Ohio.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

**MACHINERY— Forming**
Eisler Engineering Co., Newark 3, N. J.
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.

**MACHINERY—Galvanizing**
Wilson, Lee, Engr. Co., Cleveland, Ohio.

**MACHINERY—Galvanizing Wire**
Broden Construction Co., Cleveland, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

**MACHINERY—Gang Winders**
Fidelity Machine Co., Philadelphia, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Grinding**
Norton Co., Worcester, Mass.

**MACHINERY—Insulating**
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Knitting**
Fidelity Machine Co., Philadelphia, Pa.

**MACHINERY—Lead Encasing Presses, etc.**
Robertson, John, Co., Brooklyn, N. Y.

# WHERE TO BUY, Continued

**MACHINERY—Lead Stripping**
Robertson, John, Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Lock Washer**
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

**MACHINERY—Magnet Wire**
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.

**MACHINERY—Material Handling**
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

**MACHINERY—Measuring Wire & Cable**
Durant Mfg. Co., Milwaukee, Wis.
Lyon-Vail Machine Co., Brockton, Mass.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.

**MACHINERY—Nail and Tack**
Broden Construction Co., Cleveland, Ohio.
Glader, Wm., Machine Works, Chicago, Ill.
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

**MACHINERY—Panning**
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.

**MACHINERY—Pointing**
Broden Construction Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

**MACHINERY—Quill Winding**
Fidelity Machine Co., Philadelphia, Pa.

**MACHINERY—Rod Mill**
Broden Construction Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.

**MACHINERY—Rolling Mill**
Broden Construction Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

**MACHINERY—Rubber for Insulating Wire**
Royle, John, & Sons, Paterson, N. J.

**MACHINERY—Rubber Tubing and Straining**
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Screw Wire**
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

**MACHINERY—Special**
American Insulating Mach'y Co., Phila., Pa.
Broden Construction Co., Cleveland, Ohio.
Emory, Robert J., Co., Newark, N. J.
New England Butt Co., Providence, R. I.
Nilson, A. H., Machine Co., Bridgeport, Conn.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I. (Special Designs)
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Spooling**
American Insulating Mach'y Co., Phila., Pa.
Eisler Engineering Co., Newark 3, N. J.
Emory, Robert J., Co., Newark, N. J.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Spring Making**
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

**MACHINERY—Staple**
Sleeper & Hartley, Inc., Worcester, Mass.

**MACHINERY—Straightening**
Broden Construction Co., Cleveland, Ohio.
Lewis Machine Co., The, Cleveland, Ohio.
Moslo Machinery Co., Cleveland, Ohio.
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Ruesch, H. J., Machine Co., Newark, N. J.
Shuster, F. B., Mfg. Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

**MACHINERY—Stranding**
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Strip Steel**
Broden Construction Co., Cleveland, Ohio.
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.

**MACHINERY—Swaging**
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

**MACHINERY—Taping**
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Testing Equipment—Sparkers**
Davis, R. L., Electric Co., Wallingford, Conn.
Entwistle, Jas. L., Pawtucket, R. I.

**MACHINERY—Testing Spring**
Standard Machinery Co., Providence, R. I.

**MACHINERY—Tinsel Rolling Mflls**
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.

**MACHINERY—Trolley Wire**
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

**MACHINERY—Tube Mill**
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co, Torrington, Conn.

**MACHINERY—Welding Wire**
Eisler Engineering Co., Newark 3, N. J.
Micro Products Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.
Syncro Machine Co., Rahway, N. J.

**MACHINERY—Winding**
American Insulating Mach'y Co., Phila., Pa.
Eisler Engineering Co., Newark 3, N. J.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Wind-up**
Entwistle, Jas. L., Co., Pawtucket, R. I.
Industrial Oven Engr. Co., Cleveland, Ohio.

**MACHINERY—Wire Bending**
Eisler Engineering Co., Newark 3, N. J.
Nilson, A. H., Co., Bridgeport, Conn.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

**MACHINERY—Wire Drawing**
American Insulating Mach'y Co., Phila., Pa.
Broden Construction Co., Cleveland, Ohio.
Eisler Engineering Co., Newark 3, N. J.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

**MACHINERY—Wire Measuring**
Durant Mfg. Co., Milwaukee, Wis.
Lyon-Vail Machine Co., Inc., Brockton, Mass.
New England Butt Co., Providence, R. I.

**MACHINERY—Wire Rope**
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Wire Tinning**
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.

**MACHINERY—Wood Screw**
National Machinery Exchange (Used), New York, N. Y.

**MATERIAL HANDLING EQUIP.**
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

**MILLS—Tandem Rolling and Edging**
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co, Torrington, Conn.

**NAILS—Wire**
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburg, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

**NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip**
Hudson Wire Co., Ossining, N. Y.

**OILS—Wire Drawing**
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Shell Oil Co., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

**OVENS—Cable Lacquering**
American Insulating Mach'y Co., Philadelphia, Pa.
Industrial Oven Engr. Co., Cleveland, Ohio.

**OVENS—Dehydrogenizing**
Industrial Oven Engr. Co., Cleveland, Ohio.

**OVENS—Industrial**
Carl-Mayer Corp., Cleveland, Ohio.
Industrial Oven Engr. Co., Cleveland, Ohio.
Ross, J. O., Engineering Corp., New York, N. Y.

**OVENS—Welding Rod Coating**
Industrial Oven Engr. Co., Cleveland, Ohio.
Moslo Machinery Co., Cleveland, Ohio.
Ross, J. O., Engineering Corp., New York, N. Y.

**PAINTS—Heat Resisting**
American Chemical Paint Co., Ambler, Pa.

**PAINTS—Marine**
American Chemical Paint Co., Ambler, Pa.

**PAINTS—Structural Steel**
American Chemical Paint Co., Ambler, Pa.

**PANS—Lead and Spelter**
National Annealing Box Co., Washington, Penna.

**PANS—Vulcanizing**
Mossberg Pressed Steel Corp., Attleboro, Mass.

**PAPER—Creped Wrapping**
Crepe-Kraft Co., Newark, N. J.

**PAPER—Insulating**
Angier Sales Corp., Framingham, Mass.
Crepe-Kraft Co., Newark, N. J.

**PAPER TESTERS—**
Scott, Henry L., Co., Providence, R. I.

**PATENT ATTORNEYS—**
Lancaster, Allwine and Rommel, Washington, D. C.

**PICKLING COMPOUNDS—**
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

**PICKLING TANK LININGS—**
Ceilcote Co., The, Cleveland, Ohio.
Haveg Corp., Newark, Del.
Heil Engineering Co., Cleveland, Ohio.
Keagler Brick Co., Steubenville, Ohio.
Sauereisen Cement Co., Pittsburgh, Pa.

**PIPES & FITTINGS—Acid Resistant**
Ceilcote, The, Co., Cleveland, Ohio
Haveg Corp., Newark, Del.
Heil Engineering Co., Cleveland, Ohio.

**PLASTIC TESTERS—**
Scott, Henry L., Co., Providence, R. I.

**POTS—Lacquer**
Industrial Oven Engr. Co., Cleveland, Ohio.

**POTS—Lead Melting**
National Annealing Box Co., Washington, Pa.
Robertson, John, Co., Brooklyn, N. Y.

**POWDER—Wire Drawing**
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Homer, N. Y.
Magnus Chemical Co., Garwood, N. J.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

**PRESSES—Hydraulic and Mechanical**
Robertson, John, Co., Brooklyn, N. Y.
Standard Machinery Co., Providence, R. I. (Mechanical Only)

# WHERE TO BUY, Continued

**PRESSES—Lead**
Robertson, John, Co., Brooklyn, N. Y.

**PRESSURE VESSELS—**
National Annealing Box Co., Washington, Penna.

**PULLERS—Wire**
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

**PUMPS—Hydraulic**
Robertson, John, Co., Brooklyn, N. Y.

**REEL AND TENSION STAND—**
Fidelity Machine Co., Philadelphia, Pa.
Industrial Oven Engr. Co., Cleveland, O.
Moslo Machinery Co., Cleveland, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

**REEL CRUTCHES—**
Watson Machine Co., Paterson, N. J.

**REELS—Annealing and Stranding**
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

**REELS—Steel**
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

**REELS AND SPOOLS—Shipping and Shop**
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

**REELS—Takeoff**
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

**REELS—Traverse**
Hubbard Spool Co., Chicago, Ill.
Stevens Metal Products Co., Niles, Ohio.

**REELS—Vulcanizing & Impregnating**
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

**REELS—Wire Drawing**
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

**REFRACTORIES—High Temperature**
Norton Co., Worcester, Mass.

**ROD BAKERS—**
Carl-Mayer Corp., The, Cleveland, Ohio.
Ross, J. O., Engineering Corp., New York, N. Y.

**RODS—Wire—Non-Ferrous**
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

**RODS—Wire—Steel**
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

**ROLL STRAIGHTENERS—**
Moslo Machinery Co., Cleveland, Ohio.

**ROPE—Wire**
Bethlehem Steel Co., Bethlehem, Pa.
Brewer Mfg. Co., Muncy, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.

**RUBBER AND RUBBER COMPRESSION TESTERS—**
Scott, Henry L., Co., Providence, R. I.

**RUST PROOF COMPOUNDS—**
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

**RUST REMOVING COMPOUNDS—**
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.

**SATURATION SYSTEMS—**
Industrial Oven Engr. Co., Cleveland, Ohio.

**SHEARS—**
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

**SHEET—Steel**
Continental Steel Corp., Kokomo, Indiana.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.

**SOAPS—Industrial and Wire Drawing**
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Potter, Neil C., Newark, N. J.
Shell Oil Co., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

**SOLVENT RESIN SYSTEMS—Experimental**
Industrial Oven Engr. Co., Cleveland, Ohio.

**SPOOLS—Annealing and Wire Drawing**
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

**SPOOLS—Shipping and Shop**
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

**SPOOLS—Steel**
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

**SPRINGS—Steel**
Wickwire Spencer Steel Co., New York, N. Y.

**STAMPINGS—Steel**
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

**STRAND—Steel and Copper**
Brewer Mfg. Co., Muncy, Pa.

**STRIP—Brass and Non-Ferrous**
Hudson Wire Co., Ossining, N. Y.

**STRIP—Steel**
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.

**STRIP METAL TESTERS—**
Scott, Henry L., Co., Providence, R. I.

**SWIFTS—Take-off**
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.

**TANK LININGS—Brick**
Ceilcote Co., The, Cleveland, Ohio.
Keagler Brick Co., Steubenville, Ohio.
Nukem Products Corp., Buffalo, N. Y.

**TANKS—Pickling**
Ceilcote, The, Co., Cleveland, Ohio
Haveg Corp., Newark, Del.
Heil Engineering Co., Cleveland, Ohio.
Nukem Products Corp., Buffalo, N. Y.
Sauereisen Cements Co., Pittsburgh, Pa.

**TANKS—Steel**
Mossberg Pressed Steel Corp., Attleboro, Mass.
National Annealing Box Co., Washington, Pa.

**TENSILE TESTERS—**
Scott, Henry L., Co., Providence, R. I.

**TESTING INSTRUMENTS—**
Davis, R. L., Electric Co., Wallingford, Conn.
Scott, Henry L. Co., Providence, R. I.

**TOOLS—Wire Cutting**
Porter, H. K., Inc., Everett, Mass.

**TRAMRAIL SYSTEMS—**
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

**TRAVERSES—**
Hubbard Spool Co., Chicago, Ill.
Stevens Metal Products Co., Niles, Ohio

**TREADS—Safety**
Norton Co., Worcester, Mass.

**TRUCKS—**
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

**TUBE BENDERS AND FORMERS—**
Ruesch, H. J., Machine Co., Newark, N. J.

**TURKS HEADS—Friction and Power Driven**
Standard Machinery Co., Providence, R. I.

**VALVES AND FITTINGS—Acid Resistant**
Haveg Corp., Newark, Del.

**VULCANIZERS—**
Watson Machine Co., Paterson, N. J.

**VULCANIZING PANS—**
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

**WELDERS—Spot and Butt**
Eisler Engineering Co., Newark 3, N. J.
Micro Products Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.

**WIND-UP AND UNWIND SYSTEMS—Continuous**
American Insulating Mach'y Co., Philadelphia, Pa.
Entwistle, James L., Co., Pawtucket, R. I.
Industrial Oven Engr. Co., Cleveland, Ohio.

**WIRE—Cast**
Youngstown Sheet & Tube Co., Youngstown, Ohio.

**WIRE—Cold Heading**
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A. Sons, Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

**WIRE—Electric**
Hudson Wire Co., Ossining, N. Y.

**WIRE—Enameled for Coils**
North American Philips Corp., Dobbs Ferry, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

**WIRE—Manufacturers**
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A. Sons, Co., Trenton, N. J.
Spencer Wire Co., West Brookfield, Mass.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

**WIRE—Music**
Spencer Wire Co., West Brookfield, Mass.

**WIRE—Nickel Silver and Phosphor Bronze**
Hudson Wire Co., Ossining, N. Y.
Spencer Wire Co., West Brookfield, Mass.

**WIRE—Non-Ferrous to Specification for Special Purposes**
Hudson Wire Co., Ossining, N. Y.
North American Philips Corp., Dobbs Ferry, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

**WIRE—Spring**
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Spencer Wire Co., West Brookfield, Mass.
Wickwire Spencer Steel Co., New York, N. Y.

**WIRE—Stainless Steel**
Firth-Sterling Steel Co., McKeesport, Pa.
Spencer Wire Co., West Brookfield, Mass.
Wickwire Brothers, Inc., Cortland, N. Y.

**WIRE—Steel—Also Coppered Steel—Also Galvanized Steel**
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A. Sons, Co., Trenton, N. J.
Spencer Wire Co., West Brookfield, Mass.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

**WIRE AND STRIP—Zinc**
Platt Bros. & Co., The, Waterbury, Conn.

**WIRE TESTERS—**
Scott, Henry L., Co., Providence, R. I.

**WIRE, WEAVING—Non-Ferrous**
Hudson Wire Co., Ossining, N. Y.

**WRAPPING PAPER—Creped**
Crepe-Kraft Co., Newark, N. J.

**YARN TESTERS—**
Scott, Henry L., Co., Providence, R. I.

**YARNS AND TAPES—**
Cheney Bros., New York, N. Y.
DuPont, de Nemours, E. I. Corp., Wilmington, Del.
Owen Corning Fiberglas, Toledo, Ohio

# WINCO

## *for magnet wire products that must do the job!*

**ENAMELED COPPER**
**ENAMELED IRON**
**ENAMELED ALLOY**
**ENAMELED ALUMINUM**
**TWISTED MULTIPLES**
**PARALLEL MULTIPLES**

**SILK COVERED**
**COTTON COVERED**
**CELANESE COVERED**
**GLASS FIBRE COVERED**
**LITZENDRAHT AND**
**SPECIALS TO ORDER**

● There's more to present day engineering and design problems than shortages of materials, priorities, etc. There is also the question of whether specifications have been rigidly adhered to. Wire, for example, must meet such requirements as specific electrical properties, flexibility, tensile strength, laying speed, uniformity, etc.

Whether it's a buyer's or seller's market, WINCO magnet wire products are drawn to exact specifications. Uniformity of product is guaranteed by mercury process tests and careful supervision guards against variations in consistency, structure or electrical values.

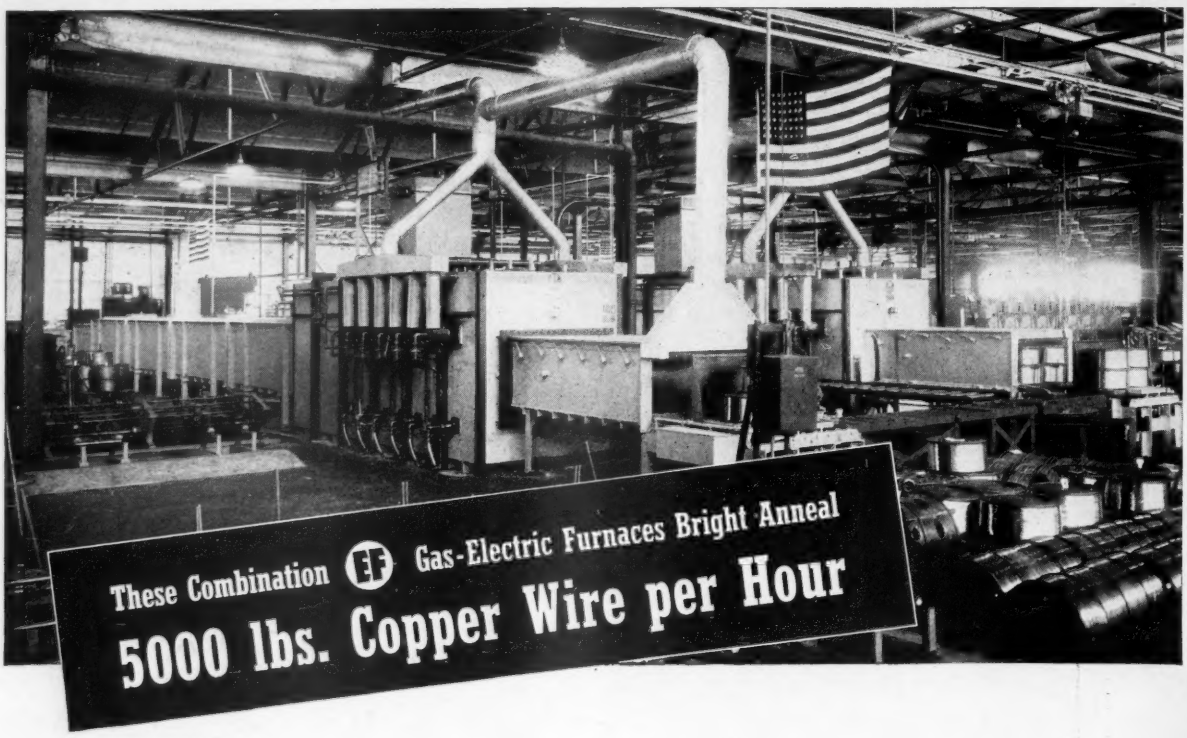
If you have a wire problem, our complete facilities are at your disposal. Send blueprints or specifications for recommendations, without obligation. Samples sent on request; write today.

## WINSTED DIVISION

WINSTED HUDSON WIRE COMPANY CONNECTICUT

# EF FURNACES

## For Every Industrial Heat Treating Process




# Bright, Uniformly Annealed Wire

Bright, uniformly annealed copper wire—at the rate of 2½ tons per hour—is produced continuously in the above combination gas-electric, controlled atmosphere furnaces. These furnaces handle rod in coils up to 36" in diameter as well as wire on large reels. The material is carried through the furnaces on bulk-head type trays which provide an effective seal for the protective atmosphere used in the equipment. These trays eliminate the necessity of doors, lock chambers, or other sealing devices at either the charging or discharging nds of the furnaces.

The heating chambers are divided into two separately and automatically controlled zones. The first or charging zone of each furnace is heated by EF gas-fired recuperative type radiant tubes. The soaking zones are heated by heavy V-type cast alloy heating elements.

The heating elements in each zone are located above and below the charge and extend the entire width of the chambers, insuring absolute temperature uniformity throughout the charge.

The protective atmosphere is produced in an EF generator located between the furnaces.

Other recent outstanding production furnace installations include furnaces for bright annealing both ferrous and non-ferrous strip, wire, tubing and other products . . . furnaces for the production heat treatment of tank armor castings, cartridge cases, shell forgings, bomb and gun parts, machine gun cartridge clips, aircraft and aircraft engine parts, aluminum and magnesium castings, bolts, springs, and many other allied products.

We specialize in designing and building production furnaces.

## The Electric Furnace Co., Salem, Ohio

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